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The Prevalence of ADHD in Candidates for Gastric Bypass Surgery: Are Overeating and Obesity Accounted for by the Attention Deficits and Impulisivity of ADHD?

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THE PREVALENCE OF ADHD IN CANDIDATES FOR GASTRIC BYPASS SURGERY: ARE OVEREATING AND OBESITY ACCOUNTED FOR BY THE ATTENTION DEFICITS AND IMPULSIVITY OF ADHD?

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Dissertation Approval

This is to certify that the thesis presented to us by Andrea M. Parry on the 5th day of May 2011, in partial fulfillment of the requirements for the degree of Doctor of Psychology, has been examined and is acceptable in both scholarship and literary quality.

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Abstract

The purpose of this study was to determine the prevalence of Attention Deficit-Hyperactivity Disorder (ADHD) and general psychological characteristics in an adult, presurgery population of patients seeking Gastric Bypass (GB). An ADHD diagnosis was defined as clinically significant scores as measured by the Conners Adult ADHD Rating Scale (CAARS). Other psychological characteristics were assessed using the Minnesota Multiphasic Personality Inventory – Second Edition (MMPI-2). The sample was selected from a homogeneous adult outpatient population. Participants meeting inclusion criteria presented for psychological assessment preparatory to GB surgery at the office of Dr. Steven Walfish. Participants were excluded if they failed to complete valid CAARS and MMPI-2 protocols. The study was correlational in design. Results indicated that endorsement of psychological problems in a population seeking GB was consistent with the prevalence of ADHD in the general population. The participants endorsed a high rate of hyperactivity-impulsivity. The results of the study also revealed subclinical correlations between problems with executive functioning and psychological conditions. This sample was of a relatively high socioeconomic status, which may have selected against more severe psychopathology. Future research should examine the aforementioned characteristics in a lower socioeconomic sample.

Keywords: ADHD, adults, MMPI-2, CAARS, comorbidity, gastric bypass, trauma, somatization, obesity

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“Never give up. Never, never give up! We shall go on to the end.”

– Winston Churchill

Chapter One: Introduction

Statement of the Problem

Obesity is a major cause of preventable death, with estimates ranging as high as 32.2% among adult men and 35.5% among adult women in the United States (Flegal, Carroll, Ogden, & Curtin, 2010). Bariatric surgery, specifically gastric bypass (GB), has become an increasingly common medical intervention designed to treat obesity. Many insurance companies and surgeons require a preoperative psychological evaluation in order to identify psychosocial risk factors that could impede postoperative treatment outcome (LeMont, Moorehead, Parish, Reto, & Ritz, 2004; Walfish, 2003).

Both obesity and Attention Deficit Hyperactivity Disorder (ADHD) have physical and psychological characteristics; however, very limited research has been conducted to examine closely the relationship between the aforementioned disorders. Although preliminary findings demonstrate a higher rate of ADHD among obese patients seeking GB than that found in the general population, a review of the literature revealed a single study, by Altfas (2002), specifically addressing the comorbidity between ADHD and obesity in patients seeking GB.

In his study, Altfas (2002) noted that bariatric patients tend to demonstrate poor "focus" during treatment and often fail to lose weight or maintain reduced weight. Essentially, the highest prevalence of ADHD was in individuals in the morbid obesity range. Morbid obesity is defined as a body mass index greater than 40 (BMI > 40). High rates of both obesity and ADHD indicated poorer prognostic outcome for weight loss.

One limitation of this study was that it employed an untested measure, namely a semi-structured interview; therefore, the present study aims to contribute to the literature by using empirically supported measures to assess this population. While individuals with ADHD tend to have executive-functioning deficits, such as problems with planning and impulse control (Barkley, Murphy, & Fischer, 2008), the prevalence of ADHD in patients seeking GB has not been established clearly because previous research findings have relied on measures that are not empirically supported (Altfas, 2002). It is hypothesized that there is a high prevalence of ADHD, which is related to deficits in executive functioning in adults with obesity.

Overweight and obesity both have shown positive associations with depressive symptoms (Mather, Cox, Enns, & Sareen, 2009). For example, Conradt, Dierk, Rauh, Hebebrand, and Rief (2008) sought to determine the associations among weight-related coping responses, weight- and body-related shame, and feelings of guilt with weight change over 6 months in a nonclinical sample of obese individuals. Their findings indicated that obese individuals became distressed regarding their obesity status when they were in evaluative situations and also in situations that were related to physical functioning. In other words, Conradt et al. (2008) found significant correlation between distress ratings and shame/guilt subscales scores (.59 and .53, respectively). These results indicate that psychological distress in obesity tends to become activated when individuals encounter situations that pertain to evaluation by others.

In many cultures, being overweight can lead to enormous stress. Specifically, psychological factors, such as defensiveness, shame, and somatization, may be related to underlying body-image dissatisfaction in overweight and obese individuals. The current gap in the literature regarding the prevalence of ADHD and the relationship of this disorder to other psychological symptoms in adults with obesity leads directly to the purpose of this study.

Purpose of the Investigation

The purpose of the present investigation is to examine the psychological characteristics of patients seeking GB. More specifically, the study aims to determine the prevalence of ADHD and other psychological factors in patients who are seeking GB surgery. While it has been established that individuals with ADHD tend to experience comorbid psychological conditions at greater rates and severity than those without ADHD, the relationship between ADHD and patients seeking GB has not been thoroughly examined in a methodologically sound fashion.

Relevance to Cognitive Behavioral Therapy

Cognitive behavioral therapy (CBT) helps individuals to recognize their existing maladaptive cognitive patterns and belief structures in order to modify them and replace them with alternative and more accurate thoughts and beliefs (Beck, 1964; Beck, 1976). CBT is considered to be the nonpharmacological treatment of choice for adults with ADHD because this group may engage in cognitively distorted thinking more frequently

than does the general population. Essentially, adults with ADHD are particularly vulnerable to the development of negative belief systems about themselves, the world, and the future as a result of life experiences affected by the devastating consequences of this disorder (Ramsay & Rostain, 2008b).

In addition to the empirically supported evidence for CBT as the treatment of choice for adults with ADHD, CBT has been established also as the psychological treatment of choice for binge-eating disorder (BED) (Wilson, Grilo, & Vitousek, 2007) which can co-occur with obesity. For example, Munsch et al. (2007) sought to determine the efficacy of CBT in comparison to a behavioral weight-loss treatment (BWLT) in 80 obese patients who met criteria for BED. Preliminary findings suggested that CBT was more efficacious than BWLT insofar as participants reported faster improvement in symptoms with CBT, as evidenced by fewer self-reported binges. Although not the sole etiology, BED is recognized as a co-occurring problem in adults with obesity. Overall, there is a gap in the literature pertaining to the role of attention deficits in patients seeking GB. By uncovering this link, clinicians may be able to develop more individualized treatment plans geared toward targeting these individuals.

Chapter Two: Literature Review

Obesity: Prevalence and Treatment

Obesity refers to an excess accumulation of adipose tissue and is typically calculated using the Body Mass Index (BMI), which corresponds relatively closely to degree of adiposity (Perri & Corsica, 2003). The formula for calculating BMI is weight (in kilograms) divided by height in meters, squared. Obesity has become a major cause of preventable death per results of recent national surveys, with estimates ranging as high as 32.2% among adult men and 35.5% among adult women in the United States (Flegal et al., 2010). Physical conditions related to obesity include type 2 diabetes, cardiovascular problems, cancers, and increased risk of death (Adams et al., 2006; Bender, Zeeb, Schawrz, Jockel, & Berger, 2006; Fogelholm, 2010). The World Health Organization (WHO, 1998) developed a classification system for categorizing overweight and obesity in adults according to BMI (Table 1):

Table 1

World Health Organization Classification System of Overweight Based on BMI

BMI	Category	Risk for Comorbid Conditions
<18.5	Underweight	Low
18.5-24.9	Normal weight	Average
25.0-29.9	Pre-obese	Increased
30.0-34.9	Obesity Class I	Moderate
35.0-39.9	Obesity Class II	Severe
≥40.0	Obesity Class III	Very severe

Note. Table refers to BMI range with corresponding categorical weight classification and subsequent risk for comorbid health conditions.

Obesity Treatment

Bariatric surgery represents the treatment of choice for Class III obesity because lifestyle and pharmacological interventions produce very limited results for these patients (Albrecht & Pories, 1999). The number of GB surgeries performed increased from 14,000 in 1998 to 108,000 in 2003 (Kinder, Walfish, Young & Fairweather, 2008). There are two major types of bariatric surgery: adjustable gastric banding, which is reversible and less invasive, and Roux-en-Y GB, which is more invasive (Walfish, Kinder, Young, Fairweather, & Bradley, 2010). The Roux-en-Y GB procedure creates a small gastric pouch via stapling, and a limb of the jejunum (small intestine) is attached directly to the pouch, which results in ingested food bypassing 90% of the stomach, the duodenum, and a small portion of the proximal jejunum (Kral, 1995). Everson, Kelsberg, and Nashelsky (2004) found that GB results in weight loss of approximately 33% at 2 years and 25% at

8 years post surgery. The health implications of obesity are clear, but potential complications are associated with maintenance of GB weight loss. Perri and Corsica (2003) noted that while the most reinforcing aspect of the surgical intervention is weight loss, it generally stops or slows before most patients reach their desired weight goal. This aspect understandably would be particularly difficult for individuals with ADHD, considering the known difficulties with delaying gratification and adopting long-term strategies in this population. In order to assess potential adverse psychological complications in patients requesting GB surgery, exciting research has been conducted as an important component to the assessment process.

Assessment of psychological profiles of patients seeking GB

Maddi, Khoshaba, Persico, and VanArsdall (1997) sought to clarify the extent and nature of psychopathology in individuals with morbid obesity in a national sample. The 1,027 participants completed the MMPI-2, which is a comprehensive measure of psychopathology. The authors investigated 855 women and 99 men who were referred for surgical help for their obesity. The average BMI was 46.13 (*SD* = 7.75). The participants also completed an intensive interview regarding psychosocial history and a medical examination. The researchers found significant elevations on the MMPI-2 clinical scales pertaining to depression (45% of the sample), anxiety (32.5% of the sample), and somatic complaints (40.6% of the sample). Furthermore, regression analyses demonstrated that abuse of the participant and substance use in the family-of-origin were related to higher elevations on clinical scales 1, 2, and 3. Scales 1, 2, and 3 were

predicted positively by substance use in the family-of-origin (Beta = -0.116, T = 2.34, $p >$ 0.01). Furthermore, the researchers found that the more education the participant obtained, the greater the counteracting effects on psychopathology it had (Beta -0.127, T = -2.57, p > 0.01).

Kinder et al. (2008) attempted to replicate the work of Maddi et al. (1997). The purpose of the replication study by Kinder et al. (2008) was to determine any changes in the psychological profiles of patients seeking GB within the 10 years between the two studies, considering that the number of patients presenting for GB surgery increased. The authors investigated 398 adult female patients who were referred for assessment as part of an overall evaluation for the surgery. The average BMI of the patients was 48.38 (*SD* = 8.38), and histories of physical and sexual abuse were commonly reported (sexual abuse = 19.3%; physical abuse 21.1%). Psychological measures used were MMPI-2, Weight and Lifestyle Inventory Section H (WALI), Beck Depression Inventory (BDI-II), State-Trait Anger Expression Inventory-2 (STAXI-2), State-Trait Anxiety Inventory (STAI), and the Shipley Institute of Living Scale (SILS). Compared to the original findings by Maddi et al. (1997), Kinder et al. (2008) found that a greater proportion of participants in their study yielded elevations on MMPI-2 clinical scale 1 between a T score of 50 (the population mean) and a T score of 65 (the cutoff point of clinical significance) (51% vs. 45%). Scale 1 on the MMPI-2 is an indication of hypochondriacal symptoms. Clinical elevations on scale 3 (hysteria) were associated with higher scores on the BDI-II and trait anxiety scores.

Compared to the original study by Maddi et al. (1997), Kinder et al. (2008) found significantly fewer clinical elevations on MMPI-2 scale 6, Paranoia (17.7% vs. 11.6%, respectively). Additionally, higher MMPI-2 elevations were found on the L and K scales. These scales are associated with defensiveness (K scale) and an attempt to "fake good" (L scale) on the MMPI-2. Also, higher scores on a scale designed to measure malingering (F scale) were positively correlated to higher scores on the BDI-II.

Overall, the researchers found consistently that higher MMPI-2 scores, in general, were associated with significantly higher scores on the other independent measures of psychopathology. However, Kinder et al. (2008) concluded that many morbidly obese patients presenting for GB have elevated MMPI-2 profiles, some of which would be considered "invalid" based upon the L, F, and K scores found in their samples. Walfish (2007) noted that the MMPI-2 appears to be an important psychometric measure that includes a validity scale in the evaluation process for GB surgery because patients may be motivated to present in a defensive manner likely caused by fear that surgeons will deny their surgery if they are diagnosed with psychological problems that could interfere with positive outcome. Given the complicated clinical picture, the need for clarification of the psychological profile of patients seeking GB surgery seems clear.

Eating pathology.

Pathology related to eating behavior may be related to adult (ADHD). While impulsive behavior is a symptom of ADHD, impulsivity also may contribute to overeating, leading to the development of obesity. Factors that relate to ADHD symptoms

also may affect the neurobiology of reward, increasing the reinforcing properties of food and resulting in food intake (Ringham, Levine, & Marcus, 2009). Consumption of high calorie food in adults with ADHD could possibly serve a self-medicating function because of its ability to activate dopamine in the common reward pathway (Davis et al., 2009). Animal, genetic, and neuro-imaging studies suggest that the dopaminergic system plays a role in both the biology of ADHD and the reward system of food-seeking behavior (Holtkamp et al., 2004). Blum and Noble (2001) noted that hypo-dopaminergic brain activity creates a Reward Deficiency Syndrome, a condition that is characterized by anhedonia and diminished motivation. Considering this information, it is evident that eating pathology in adults with ADHD has clear biological underpinnings and may be related to the same underlying deficit.

In a sample of 215 patient medical records, Altfas (2002) found that 27.4% of the entire sample met criteria for ADHD, while 42.6% of individuals with a BMI greater than 40, considered morbidly obese, met criteria for ADHD. Additionally, of the group with comorbid obesity and ADHD (OB + ADHD), the mean weight loss post surgery was 2.6 in BMI versus 4.0 in BMI for individuals who did not meet criteria for ADHD. Individuals with OB + ADHD also had more clinic visits and were in treatment for a longer duration. None of the study participants met criteria for the hyperactivity-impulsivity subtype and, therefore, were all classified as meeting *DSM-IV-TR* (2000) criteria for the inattentive type of ADHD. A diagnosis of ADHD was made during the course of the patient's obesity treatment using semi-structured interviews.

However, in addition to the methodological limitation of using semi-structured interviews, additional limitations of the study included that the fact that about 90% of his patients were middle-aged women. Although he did not collect data regarding socioeconomic status, Altfas (2002) surmised that his research participants did not reflect the general population because older individuals may be more likely to afford noninsured medical care, indicating that obesity treatment is not covered under most insurance policies and that these patients may have been of a higher socioeconomic status than individuals who cannot afford to pay for medical care out-of-pocket. Altfas posited that although reasons for comorbidity between OB + ADHD are unknown, brain dopamine or insulin receptor activity might play a role in comorbidity between OB + ADHD. Altfas encouraged replication of his findings, which could have important implications for treatment of severe and extreme obesity.

Atomoxetine is a norepinephrine uptake inhibitor that is currently marketed for the treatment of ADHD. Gadde, Yonish, Wagner, Foust, & Allison (2006) conducted a 12-week, randomized, double-blind, clinical trial in a sample of 30 obese women with an average BMI of 36.1 were randomly assigned to receive either atomoxetine or placebo. Participants were administered a starting dose of 25 mg/day, tapering up to 100 mg/day within the first week. By the end of the trial, the atomoxetine group lost an average of 3.6 kg (3.7% of their body mass) versus a 0.1-kg gain in the placebo group. Gadde et al., (2006) concluded that atomoxetine demonstrated a modest short-term weight loss in a preliminary study including women with obesity.

McElroy et al. (2007) examined the effectiveness of atomoxetine in the weight loss of individuals with binge-eating disorder (BED). Their sample was small (n = 40), and the study was a 10-week, double-blind, clinical trial in which half of the participants were administered flexible doses ranging from 40 to 120 mg/day of atomoxetine while the other half received placebo. The primary outcome measure was the frequency of binge-eating episodes. The results of the study indicated that there was a significantly greater reduction in frequency of binge-eating episodes in weight, and in BMI. The authors concluded that atomoxetine was efficacious in the short-term treatment of BED.

In another study, Davis et al. (2009) examined a sample of 110 healthy women between the ages of 25 and 46 years (M = 33.3 years; SD = 6.7) to assess the relationship between ADHD symptoms and aspects of overeating, including binge eating and emotionally induced eating. Davis et al. speculated that individuals with ADHD have a diminished ability to assess the future adverse health consequences of overconsumption and increased body weight.

Therefore, Davis et al. (2009) also assessed the role of dopamine (DRD3) receptor in ADHD symptoms, considering that dopamine has been associated with impulsivity and addictions. Participants were recruited through college campuses, hospitals, and community centers. Normal-weight participants comprised 47% of the sample, while overweight and obese participants comprised 21% and 30% of the sample, respectively.

Childhood symptoms of ADHD were assessed retrospectively using the Wender Utah Rating Scale (WURS) and Impulsivity was assessed using the 4-point Barratt Impulsivity Scale. Participants also completed the Conners Adult ADHD Rating Scale – Self-report Screening Version (CAARS-SSV). A venous blood sample was procured from each participant, and subsequently DNA was extracted from the whole blood. The researchers then examined the structure of the DRD3 gene and compared it to the results of the ADHD rating scales. They discovered that dopamine was associated with ratings of hyperactivity and impulsivity. Davis et al. found that ADHD symptoms were significantly elevated in the BED group and obese group compared to those of the normal-weight group. Considering that hyperactivity and impulsivity are central features of ADHD, and given the association between the aforementioned symptoms and dopamine, the researchers concluded that similar to other addictive substances, food also likely serves a self-medicating function for individuals with attentional problems.

Yates, Lund, Johnson, Mitchell, and McKee (2009) examined the prevalence of ADHD in 189 women admitted for inpatient treatment of an eating disorder using the Structured Clinical Interview (SCID-1) and ADHD Interview from the Multi-International Psychiatric Interview (MINI) and discovered that 21% of the sample endorsed at least six current ADHD symptoms. Fifty-five participants were classified as meeting diagnostic criteria for anorexia nervosa, restricting type; 97 for anorexia nervosa, binge-purge subtype; and 37 for bulimia nervosa. Sixty-five of the study participants were under the age of 18 years at the time of the study.

Yates et al. (2009) estimated that the prevalence rate for ADHD diagnosis was 5.8% in this population. Only one of the participants meeting ADHD diagnostic criteria came from the anorexia nervosa, restricting subtype (1.8%). The remaining nine participants with ADHD came from the anorexia nervosa, binge-purge subtype or bulimia nervosa group (6.7%). Current inattentive symptoms in those without a diagnosis of ADHD correlated with higher BMI ($p < .0001$), symptoms of bulimia nervosa, and current level of depression symptoms ($p < .025$). Essentially, these researchers found that high endorsement rates of inattentive symptoms could not be attributed to ADHD but were more likely attributable to symptoms of bulimia and the increased level of depressive symptoms. Limitations of this study included the use of open-ended historical measures (MINI) and lack of the corroborating childhood data typically used in a comprehensive assessment of ADHD, which may have led to underreporting of ADHD in this sample.

Mikami, Hinshaw, Paterson, and Lee (2008) examined the relationship between ADHD and adolescent eating pathology, operationalized as body-image dissatisfaction and symptoms of bulimia nervosa, in 228 participants (ages 6-12 years) over the course of a 5-year longitudinal study. Ninety-three of the participants were diagnosed with ADHD, combined type, while 47 of the participants met criteria for ADHD, inattentive type. These two groups were compared to 88 community-control female participants. Diagnosis of ADHD was conducted using the Achenbach Child Behavior Checklist (CBCL) and clinical interview using *DSM-IV* (1994) criteria. The researchers found that girls with the combined type of ADHD at baseline demonstrated higher rates of eating

pathology at follow-up (*M* = 0.29, *SD* = 1.09) compared to those of community controls (*M* = -0.27, *SD* = 0.22). Girls with the inattentive type of ADHD (*M* = -0.16, *SD* = 0.32) were intermediate between these two groups in terms of eating pathology. Mikami et al. (2008) concluded that a symptom of impulsivity at baseline was the best predictor of adolescent eating pathology. These findings are consistent with the aforementioned research pertaining to both the role of impulsivity in overeating and the deficits in the dopaminergic reward system of individuals with ADHD leading to attempts at self-medicating and/or self-stimulation.

Impulsivity and Eating.

Considering the aforementioned difficulties noted in eating behavior, it is logical to examine the role of impulsivity. The nature of impulsivity, manifested by impaired inhibition and deficits in self-regulation, are defining characteristics of ADHD (Barkley, 1997). Therefore, it is not surprising that health-conscious behavior that requires planning, organization, and impulse control, such as exercise and eating a proper diet, may be compromised in an adult population with ADHD. Adults with ADHD may be at greater risk for high (BMI) as a result of problems with executive functioning (Barkley et al., 2008; Gunstad et al., 2007). In fact, Altfas (2002) found that ADHD was highly prevalent among obese patients (22.8%) and highest in those with morbid obesity (42.6%) compared to overweight patients (18.9%). Gunstad et al. (2007) examined the relationship between BMI and cognitive functioning in 408 healthy individuals (ages 20 to 82 years).

While not specifically examining ADHD in their sample, Gunstad et al. found that overweight and obese individuals (BMI > 25) demonstrated poorer executive functioning on test performance compared to normal-weight adults (BMI = 18.5 - 24.9). In a study examining ADHD and obesity in patients seeking weight-loss treatment, Pagoto et al. (2009) found that the prevalence of overweight and of obesity status among adults with ADHD was 33.9% in the overweight group and 29.4% in the obesity group. In individuals without ADHD, the prevalence of an overweight status was 28.8% and of obesity was 21.6%. However, the association between ADHD and obesity in adults was no longer statistically significant when controlling for (BED) within the previous 12 months. Mediation analyses of these findings indicated that BED partially mediated the relationships between ADHD and both overweight and obesity status. Consequently, the findings by Pagoto et al. demonstrated that ADHD in adults is associated with overweight and obesity status and that the relationship is mediated by the presence of BED.

Barkley and Fischer (2010b) posited that emotional impulsivity (EI) might have a central feature in ADHD impairment beyond inattention and hyperactivity-impulsivity. In essence, they suggested that inhibition of the self and subsequent ability for an individual to self-regulate emotional states were both impaired in adults with ADHD. Taken together, the aforementioned studies indicate that executive-functioning problems in adults with ADHD extend beyond expression of symptoms in daily life and clearly demarcate the impact on individual health status, thereby suggesting that ADHD in adults affects not only one’s day-to-day life but also, potentially, one’s longevity in general.

Obesity and Childhood Trauma

While weight problems in adults with ADHD may be accounted for by the behavioral disinhibition that characterizes the disorder, childhood trauma also has been noted in adults with obesity. D'Argenio et al. (2009) examined the relationship between childhood trauma and obesity in adulthood. Specifically, they analyzed the prevalence and severity of different types of early traumatic life events, assessed the presence of coexisting psychiatric disorders, and measured adult anxious attachment style, the latter being a dysfunctional personality trait that may be associated with the presence of a psychiatric disorder, in a sample of 200 subjects undergoing psychiatric assessment for bariatric surgery. Three groups of participants were analyzed in the sample: convenience sample (CON) of individuals who were not obese and had no history of current or past *DSM-IV-TR* (2000) diagnoses (CON = 50); obese participants (OB) with no current or past history of *DSM-IV-TR* (2000) diagnoses (OB = 65); and obese participants with a current *DSM-IV-TR* (2000) diagnosis (OBPSY = 85). Healthy volunteers were students from a medical school, paramedics, and conscripts from the Italian army. D'Argenio et al. hypothesized that anxious attachment may represent a psychological factor mediating the association between early trauma and adult obesity. Essentially, attachment anxiety may contribute to eating disorder symptoms and lead to impulsive food intake and emotional eating. They found that subjects who scored higher on a scale measuring severity of traumatic events experienced during the first 15 years of life were most likely to be obese at the time of testing. The researchers concluded that not only sexual and

physical abuse but also less severe forms of early-life stress, such as separation from one or both parents or exposure to marital conflict between parents, are linked to the development of obesity later in life.

ADHD: A brief history of a diagnosis

ADHD has a long, complicated, and compelling history in the annals of medicine, psychiatry, and psychology. Dating back as far as the 18th century, physicians, philosophers, and poets alike have all made observations about children who appear restless, hyperactive, and sometimes behaviorally challenged. Although Heinrich Hoffman typically gets credit for being the first to note symptoms of ADHD in 1845, Palmer and Finger (2001) speculated that Sir Alexander Crichton was actually the first to do so in 1798. Dissatisfied with the prevailing perspective of mental illness as a moral or spiritual deficiency, Crichton published a book entitled *Inquiry*. The book described attention problems, including mental restlessness in children. His work was an outgrowth of his interest in the cause and effect of insanity and was based upon his curiosity regarding biological and physiological correlates in mental illness. Crichton's description of the mental restlessness he observed in children with attention problems was consistent with current diagnostic criteria for ADHD, inattentive type (Weyandt et al., 2003).

In 1845, Heinrich Hoffman, a German physician, wrote a children's book for his son entitled *Struwwelpeter*, or *Shaggy Peter*, that contained poems about children behaving badly and the moral consequences of their behavior. In *Struwwelpeter*, Hoffman is often credited with providing the first known reference to a hyperactive child in his poem entitled, "Die Geschichte vom Zappel-Phillip," or "The Story of Fidgety Philip" (Thome & Jacobs, 2004). Hoffman attributed Philip's behavior to poor parenting. He described Philip as a child who "won't sit still, wriggles, giggles, swings backwards

and forwards, tilts up his chair growing rude and wild" as he sits at the dinner table with his parents and knocks the food off of the table, much to their great frustration as cited in (Thome & Jacobs, 2004).

In 1902, pediatrician George Still, then practicing at King's College in London, presented a series of three lectures to the Royal Society of Medicine (Mayes & Rafalovich, 2007). Still was the first person to describe the condition medically through his clinical work with 43 children from his practice who "exhibited violent outbursts, wanton mischievousness, destructiveness and a lack of responsiveness to punishment" (Still, 1902, p. 1009). The children he described were impulsive and evidenced significant behavioral problems of the variety that would likely meet criteria for ADHD with Conduct Disorder by current *DSM-IV-TR* (2000) criteria (Barkley et al., 2008). Still regarded deficiency in moral control and capacity for attention as related to each other through neurological deficits (Still, 1902/2006). He hypothesized that these children had either a low threshold for response inhibition or a cortical disconnection syndrome in which intellect was dissociated from will, possibly caused by nerve cell changes (Still, 1902). Still proposed that immediate gratification of the self was the "keynote" quality of these and other attributes of these children (Barkley et al., 2008, p. 10).

Through his presentations, Still speculated that the behavioral problems of the children he described were caused by the results of genetics, not poor child rearing. Still's work was important because it attributed lack of morality to biological origins. He stated, "This moral deficit represented the manifestation of some morbid physical condition"

(Still, 1902, p. 1165). Still's reference to the disorder as biological in nature implied the possibility that adults could have ADHD as an outcome of its chronic childhood course (Barkley et al., 2008). In essence, it is natural to assume that ADHD could remain present in adults after childhood if the disorder has biological underpinnings.

Still was likely influenced by the work of William James (1842-1910), an American psychologist who, in his *The Principles of Psychology* (1890), described the concept of attention as an active process whereby an individual selectively withdraws from irrelevant stimuli in order to effectively attend to the preferred stimulus. Many of the children described by Still, and children later described by Tregold in 1908, would today be diagnosed as suffering from ADHD with associated oppositional defiant disorder (ODD) or conduct disorder (CD). Tregold (1922) implicated physiology and suggested that behavioral problems of the children he observed likely experienced mild brain damage during birth which went undetected until exposed by the formal demands of early education (Mayes & Rafalovich, 2007). Tregold concurred with Still that immorality was essentially a form of mental deficiency caused by abnormality on the area of the brain where the sense of morality was located. He stated that this area of the brain was more susceptible to damage because it was the product of the more recent development in the course of human evolution (Mayes & Rafalovich, 2007). Tregold (1922) stated that these children existed throughout society and not disproportionately among the lower class, as was previously believed at that time.

Both Still and Tregold recommended environmental modification and medications as the treatment for the children they observed.

Early support for a biological basis of ADHD came from an interesting source. An encephalitis epidemic spread across North America between 1917 and 1918. The illness infected roughly half of the earth's human population and killed upwards of 30 million people worldwide (Barry, 2004). Parents and physicians were aware that many children who survived the illness were left with lasting behavioral problems, presumably the result of the infection in their brains. These children exhibited characteristics that would later be considered similar to those of ADHD (Mayes & Rafalovich, 2007). In 1922, the syndrome was termed *post-encephalitic behavior disorder*. Still's disease evolved into *minimal brain damage* and, later, *minimal brain dysfunction*. This epidemic, per Mayes and Rafalovich (2007), served to make medical, rather than to make moral, unconventional behavior specific to children by prompting clinical research into what is now known as ADHD.

In 1934, Eugene Kahn and Louis H. Cohen described *organic driveness* in a *New England Journal of Medicine* article and suggested that congenital defects rather than neurological trauma were responsible for their patients' explosive behaviors. In 1937, Charles Bradley expanded upon the work of Kahn and Cohen. Bradley noted that 14 of 30 children with behavior problems demonstrated remarkable behavioral improvement during a 1-week treatment with benzedrine. The benzedrine discovery was a byproduct of Bradley's treatment of children who were suffering from

postpneumoencephalography headaches, presumably caused by spinal fluid loss. He speculated that because benzedrine is a stimulant, it would stimulate the choroids plexus to produce spinal fluid (Brown, 1998). Although the benzedrine did not improve the headaches of the children, their school teachers and the children themselves noticed a significant improvement in their schoolwork, and the medicine became dubbed *arithmetic pills* (Brown, 1998, p. 968). This was a serendipitous finding, albeit counterintuitive in that a stimulant would actually improve the behavior of hyperactive children. Bradley's 1937 discovery established the benefit of psychostimulants in the treatment of ADHD and now stands among the most important treatment findings in psychiatric history (Mayes & Rafalovich, 2007).

By 1957, there was an attempt to match symptoms of what was then called *hyperkinetic syndrome* with a specific anatomical structure in the brain. Laufer, a researcher who conducted work in the Bradley home, suggested that *hyperkinetic impulse disorder*, as the disorder came to be known, was the result of "injury to or dysfunction of the diencephalon, or midbrain, in early life" (Laufer & Denhoff, 1957). Laufer's statement was later retracted in 1975 when he stated that the children with whom he worked had no evidence of brain injury nor was there any biological or physical explanation for their behavior (Laufer, 1975). By the mid 1960s, the term *minimal brain damage* derived from the familial association of the disorder (Barkley et al., 2008), morphed to *minimal brain dysfunction*. Although this terminology still implied deficiency in the child's central nervous system, the underlying cause was vague.

The lack of clarity regarding possible causes of minimal brain dysfunction was partly a reflection of the overarching psychodynamic influences in the field of psychiatry during that time (Mayes & Rafalovich, 2007). Thus, the disorder now known as ADHD has gone by various names, depending on the perception of the root cause of the disorder over time. The year 1967 marked the beginning of a shift in the diagnostic label debate when the National Institute of Mental Health (NIMH) provided the first-ever source of funding to Keith Conners for research regarding the effectiveness of stimulants for behaviorally disturbed children (Mayes & Rafalovich, 2007). Not only was this decision by NIMH the likely catalyst for the prolific blossoming of ADHD research over the past 40 years but it also marked the underpinnings of political controversy beginning with Congressional Committee hearings in the early 1970s. The hearings reflected the perception that it was inconsistent to simultaneously recommend amphetamines for children with minimal brain dysfunction while aiming to prevent abuse of these and other drugs.

While ADHD is one of the best studied diagnoses in all of psychiatry, the debate regarding the appropriateness of millions of children using stimulant drugs has served to maintain the controversy about the legitimacy of the disorder. Mayes and Rafalovich (2007) aptly asserted that the diagnosis now referred to as ADHD has been profoundly influenced by shifting social attitudes; political controversies; major episodes of disease; scientific developments and progress, including “social Darwinism;” eugenics; the 1918 influenza epidemic; the rise of special education programs; Freud; and America’s “War on Drugs.” In short, from the 1900s to the 1970s, explanations for the disorder’s

underlying cause changed frequently, based on shifting cultural attitudes, medical developments, epistemological vicissitudes, and scientific progress.

Although the history of ADHD in childhood is extensive, there is far less information concerning the history of ADHD in adults because, for most of the past century, it was widely held to be strictly a disorder of childhood (Barkley et al., 2008). Although ADHD in adults was first noted in the research literature as far back as 40 years ago, the diagnosis did not gain widespread acceptance until the 1990s (Ramsay & Rostain, 2008b). One possible explanation for this delay could be attributed to the fact that numerous popular books were published on the subject of ADHD in adults in the 1990s; however, these books largely pertained to clinic-referred adults and the information was based on anecdotal clinical evidence of the disorder (Barkley et al., 2008; Ramsay & Rostain, 2008b). Over the past thirty years, numerous paradigms have been advanced regarding the phenomenology of ADHD.

Paradigms

Numerous models for explaining the phenomenology of ADHD have been advanced over the past 3 decades and can be grouped into various theories implicating a variety of etiologies, such as cognitive-processing deficits, dysregulated attentional systems, impaired executive inhibition, impaired executive regulation, motivation, and energetic states (Schatz & Rostain, 2006).

Cognitive Processing Model.

According to the cognitive-processing model of ADHD, information and perception processing may be slowed, accounting for many of the difficulties in ADHD, and anxiety arises primarily when one's cognitive-processing abilities are overwhelmed by the demands of the environment (Schatz & Rostain, 2006). Of course, anxiety exacerbates already compromised cognitive processes. Cognitive processing, including executive functions, such as planning, organization, and prioritizing, is impaired in many individuals with ADHD (Ramsay & Rostain, 2008b). Behavioral disinhibition, or problems with self-regulation, also interferes with the performance of the aforementioned executive functions (Barkley, 1997; Ramsay & Rostain, 2008). Schachar, Tannack, Marriott, and Logan (1995) aimed to replicate previous findings of deficient inhibitory control in subjects with ADHD (Schachar & Logan, 1990) and examined 33 children with ADHD, using *DSM-III-R* (1987) criteria, and 22 children without ADHD (ages 7-11 years) in relation to two executive-control processes, response inhibition and re-engagement of responses, which are implicated in the cognitive-processing model. In this study, subjects engaged in a primary task (a forced-choice, reaction-time task) and, occasionally and unpredictably, were presented with a stop signal (a tone) that instructed them to withhold the motor response to the primary task. Next, the researchers examined the ability of the children to shift or to re-engage an alternative response after inhibition of an ongoing response. On both the response-inhibition task and the re-engagement task,

subjects with ADHD were slower than the nonADHD controls. One limitation of this study was that all participants were male, which may limit generalizability to females.

In a subsequent study, using the same stop-signal paradigm, Schachar, Mota, Logan, Tannock, and Klim (2000) sought to determine whether deficient inhibitory control distinguished children (age range, 7 to 12 years) with a diagnosis of ADHD (N = 72), conduct disorder (N = 13), and comorbid ADHD and conduct disorder (N = 47) from community-control children, that is, children without ADHD and conduct disorder (N = 33) using *DSM-IV* criteria. They found that children with ADHD demonstrated deficient inhibition compared to the other groups as evidenced by an average slower reaction time of 70 milliseconds. Further, based on their findings, they concluded that children with comorbid ADHD and conduct disorder might represent a phenocopy of true ADHD and would be more accurately conceived as a variant of conduct disorder. These conclusions were based upon the fact that the children with comorbid ADHD and conduct disorder did not significantly differ in reaction time compared to the conduct disorder or control subjects; however, they differed significantly from children with ADHD.

Dysregulated-Arousal Model.

While the cognitive-processing model implicates slowed information and perception processing, the dysregulated-arousal model implicates an individual's ability to selectively attend to incoming stimuli. The dysregulated-arousal model posits that there is poor coordination between the posterior attentional system and the locus coeruleus, which scans incoming stimuli and disengages from the vast majority of these

stimuli. Pribram and McGuinness (1975) identified three classes of focal systems in the control of attention: phasic arousal, tonic activations or readiness, and effort. *Arousal* is defined in terms of phasic physiological responses to input. The arousal-control circuits center on the amygdala. A second system controls *tonic activation,* or readiness, which is defined in terms of tonic physiological readiness to respond. The readiness circuits center on the basal ganglia of the forebrain. A third center, whose circuitry centers on the hippocampus, coordinates arousal and activation (Pribram & McGuinness, 1975). This coordinating activity requires *effort*.

Aston-Jones, Rajkowski, and Cohen (1999) proposed that behavior must be flexible in order to adjust to new or unexpected events while simultaneously responding to the environment and filtering out irrelevant stimuli. These authors hypothesized that the locus coeruleus–norepinephrine system plays a central role in regulating the balance between focused versus flexible responding. In their research to understand the role of the locus coeruleus-norepinephrine system in cognitive activity and attention, they found that ADHD might occur in subjects whose locus coeruleus neurons exhibit the tonic mode, or readiness, inappropriately in many contexts and only infrequently transition to the phasic, or arousal, mode. As the tonic locus coeruleus mode facilitates interactions with many stimuli rather than focusing only on a subset, this simultaneous processing could produce an inability to focus attention (Aston-Jones et al., 1999). In other words, dysregulated arousal serves to displace attention to many stimuli, which makes it limiting focus on one stimulus impossible.

Executive-Inhibition Model.

The executive-inhibition model, most specifically advanced by Barkley (1997), holds that a deficit in cognitive inhibition, the executive organizer of behavior, primarily accounts for symptoms of ADHD (Barkley, 1997; Schatz & Rostain, 2006). Barkley described four executive neuropsychological functions, located in the prefrontal lobes of the brain that are dependent on inhibition for their effective execution. The executive functions Barkley described are working memory, self-regulation of affect-motivation-arousal, internalization of speech, and reconstitution (behavioral analysis and synthesis).

Executive-Dysregulation Model.

The executive-dysregulation model holds that executive regulatory control is faulty in a variety of areas in those with ADHD: activation, focus, effort, emotion, memory, and action. Dysregulation in these domains leads not only to disinhibition, as per Barkley (1997), but also to poor activation when nonreinforced attention is called for (Schatz & Rostain, 2006). Brown (2000) argued that although Barkley's model of executive inhibition is excellent at explaining deficits seen in hyperactive/impulsive ADHD, the executive-inhibition model is less effective at explaining the inattention and cognitive inefficiency seen in ADHD (Schatz & Rostain, 2006).

Motivational Model.

The motivational model, put forth by Quay (1997), implicates dysfunction in the systems that mediate response because of rewards and cessation of response/anxiety resulting from a lack of rewards (Schatz & Rostain, 2006). For example, Quay (1997)

posited the particular relevance of understanding the behavioral-inhibition system in those who seem unable to inhibit responding in the face of punishment or nonreward. The behavioral inhibition system is responsible for responding to conditioned stimuli for punishment and nonreward in order to bring about passive avoidance and extinction of behavior (Quay, 1997). Quay's theory emphasized the nucleus accumbens-striatum-orbitofrontal cortex circuit that detects errors in reward prediction.

Cognitive Energetic Model.

Sergeant's (2000) cognitive energetic model is similar to the cognitive-processing model in that it implicates computational speed in ADHD; however, this model also adds state factors, such as effort, arousal, and activation, that are subsumed under the term *energetics* (Schatz & Rostain, 2006; Sergeant, 2000). Sergeant's cognitive energetic model is comprised of three levels: computational mechanisms, energetic pools, and an evaluation mechanism. The computational mechanisms of attention include four general stages: encoding, search, decision, and motor organization. Energetic pools include effort, or the necessary energy required to meet the demands of a task; arousal, or phasic responding; and activation, which was "identified with the basal ganglia and corpus striatum" (Sergeant, 2000, p. 8). The evaluation mechanism in this model is associated with the concept of executive functioning and relates to planning, monitoring, and detecting and correcting errors. Two of these energetic pools, especially activation and effort, are particularly relevant to the inhibition hypothesis in ADHD.

In essence, activation of inhibitory processes is inadequate in individuals with ADHD, thereby leading to disinhibition of motor processes.

Hybrid Theories.

Hybrid theories also exist, and, most notably, Levy (2004) contends that neither Barkley's theory nor the behavioral-inhibition models explain the paradox that children with ADHD can at once be fearless and impulsive while also manifesting anxiety (Levy, 2004; Schatz & Rostain, 2006). Levy (2004) reconciles this paradox by explaining that the simultaneous occurrence of fearlessness and impulsivity lies within the impaired dynamics of mesolimbic dopamine systems, where reward and delay of reinforcement are determined by tonic/phasic dopamine relationships, resulting in impulsive "fearless" responses. Essentially, lowered prefrontal cortex inhibition results in impaired convergence between hippocampus and amygdala neurons at the nucleus accumbens, one of the primary dopamine systems, resulting in deficits in executive functioning observed in individuals with ADHD.

ADHD and the Evolution of the DSM Diagnosis

Similar to the paradigmatic advances in understanding ADHD, the diagnostic criteria have changed over time. The term *ADHD* evolved over decades, depending upon the perception of the root cause. The American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders (DSM)* has served as an historical record of the evolution of the diagnosis beginning in 1968, when the disorder debuted as hyperkinetic reaction of childhood. Later, the *DSM-III* (1980) renamed the diagnosis

Attention Deficit Disorder (ADD), and it was noted to occur with or without hyperactivity. The year 1980 represented another turning point in the history of the diagnosis, as it essentially became institutionalized in North American psychiatric practice when the NIMH recognized ADD as a mental disorder (Mayes & Rafalovich, 2007). The official "birth" of ADD inserted a degree of psychiatric legitimacy into the discussion of childhood hyperactivity and impulsivity with the beginnings of the contemporary nomenclature of the disorder (Mayes & Rafalovich, 2007). In the *DSM-III-R* (1987), the diagnosis included 14 symptoms. The *DSM-IV* (1994) added subtypes, and the disorder was renamed Attention Deficit/Hyperactivity Disorder. In 1998, the American Medical Association reported that ADHD was "one of the best researched disorders in medicine" (Mayes & Rafalovich, 2007). In 2000, the *DSM-IV-TR* retained the subtypes and added the Not Otherwise Specified (NOS) category.

Current Diagnostic Categories

According to the *DSM-IV-TR* (2000), ADHD is currently characterized according to four subtypes: predominantly inattentive, predominantly hyperactive-impulsive, a combined presentation of inattention and hyperactivity-impulsivity, and a category for those who do not meet full symptom criteria or NOS. According to present diagnostic criteria, some impairment must have been present before the age of 7 years, and symptoms must have persisted for at least 6 months to a degree that produced impairment and was inconsistent with the individual's developmental level. Impairment from symptoms must be present in two or more settings, with clear evidence of it in social,

academic, or occupational functioning. The predominantly inattentive type includes nine potential symptoms, with a minimum of six required to meet diagnostic criteria. Symptoms of inattentiveness include the following: failing to give close attention to details or making careless mistakes, difficulty sustaining attention, not appearing to listen when spoken to, not following through on instructions, difficulty organizing tasks, disliking or avoiding tasks that require sustained mental effort, losing items necessary for tasks or activities, being easily distracted by extraneous stimuli, and being forgetful in daily activities (APA, 2000).

The predominantly hyperactive-impulsive type includes nine symptoms, six of which indicate hyperactivity and three of which indicate impulsivity. A minimum of six symptoms from either of these subcategories collectively fulfills diagnostic criteria for this type of ADHD. Symptoms of hyperactivity include the following: often fidgets with hands and feet, often leaves seat in classroom or in other situations in which remaining seated is expected, often runs about or climbs excessively (in adolescents or adults, may be limited to subjective feelings of restlessness), often has difficulty playing or engaging in leisure activities quietly, often is "on the go" or often acts as if "driven by a motor," and often talks excessively. The impulsivity criteria include the following symptoms: "Often blurts out answers before questions have been completed; often has difficulty awaiting turn; and often interrupts or intrudes on others" (APA, 2000, p. 92).

The combined type includes both inattentiveness and hyperactivity-impulsivity in which criteria for both inattentiveness and hyperactivity-impulsivity have been met for at

least 6 months. The *DSM-IV-TR* (2000) also includes a diagnostic category for disorders with prominent symptoms of inattention or hyperactivity-impulsivity that do not meet criteria for ADHD. Some examples include individuals whose onset of symptoms and impairment occurred after the age of 7 years or those who do not meet full symptom criteria but have a behavioral pattern marked by sluggishness, daydreaming, and hypoactivity (APA, 2000). There has been a growing interest in a subtype of ADHD marked by what is referred to as Sluggish Cognitive Tempo (SCT) (Barkley, 2007; Schatz & Rostain, 2006). Interestingly, the diagnostic criteria of sluggishness, easy confusion, and daydreams were removed from the inattention dimension of ADHD in the transition from *DSM-III* (1980) to *DSM-IV* (1994). Therefore, the diagnostic category of ADHD NOS may, in part, be reflective of this emerging area of interest.

Hartman, Willcutt, Rhee, and Pennington (2004) hypothesized that SCT criteria, such as confusion and poor mental alertness, may identify a group of individuals with ADHD who are distinct from a more hyperactive form of ADHD. These researchers found support for a three-factor model of ADHD: an SCT subtype, a hyperactive subtype, and a combined subtype. They discovered that the SCT subtype had more internalizing symptoms, such as depression and anxiety, than did either the combined or the hyperactive type. Barkley (2007) noted that children with SCT manifest different problems with attention (spacey, daydreamy, easily confused, and stares a lot), under- rather than overactivity (lethargic, sluggish, slow moving, etc.), slow information processing, social withdrawal, a possibly greater risk for anxiety, and perhaps a reduced

response to stimulants. Schatz and Rostain (2006) noted that SCT is not a construct that has been well studied, while Barkley (2007) suggested that, based on the premise that ADHD is largely a disorder of inhibition, either SCT is a qualitatively different type of ADHD or it is a different disorder entirely because the SCT group does not possess deficits related to inhibition.

Sufficiency of the Current Diagnostic Criteria for Adult ADHD

Although some children with ADHD experience lifelong impairment, many individuals experience unremitting symptoms of ADHD at an early age but do not suffer impairment until the normative demands of the environment exceed their executive-functioning abilities (Ramsay, 2009). Further, long-standing difficulties experienced by individuals become intertwined with various other developmental frustrations, emotional symptoms, and life problems (Ramsay & Rostain, 2008b). While clinicians commonly observe that frustrations, emotional symptoms, and life difficulties appear as part of the clinical presentation in adults with ADHD, these aspects are not reflected in the current diagnostic criteria (APA, 2000). Ramsay (2009) suggested that the negative psychological effects experienced by many adults with ADHD are likely cumulative and corrosive.

The adult population with ADHD is a heterogeneous group in symptomatology. One source of variance is that symptom presentation may differ according to the identified age of onset of the disorder. In other words, there may be variance in symptom presentation between adults first diagnosed in childhood versus adults who were first

diagnosed in adulthood, referred to as clinic-referred adults (Barkley et al., 2008). Barkley et al. (2008) conducted two landmark longitudinal studies in which they demonstrated that there are differences in the nature of ADHD symptoms between adults diagnosed in childhood versus clinic-referred adults in their underlying factor structure, prevalence in both ADHD and nonADHD clinical samples, and age of onset. Symptoms that distinguish attentional problems in adults are not identical to symptoms that identify children with ADHD. Barkley (2007) argued that the symptoms used to diagnose children are not appropriate for diagnosing the disorder in adults.

According to Ramsay and Rostain (2008b), part of the problem with the diagnosis of ADHD in adults rests in the complexity of the disorder and its variable presentations. Symptoms, such as procrastination, overreacting to frustration, poor motivation, insomnia, and time-management difficulties, are common complaints of adults with ADHD, but these symptoms are not included in the *DSM-IV-TR* (2000) (Davidson, 2008). According to McGough and McCracken (2006), strict adherence to *DSM* criteria reduces the generalizability of clinical research findings, as adults whose symptoms are subthreshold for diagnosis, based on childhood symptoms, are excluded from clinical studies and treatment. Such underdiagnosis may result in denying care to adults who remain impaired from clinically meaningful symptoms.

Further, diagnosis according to *DSM-IV-TR* (2000) criteria is categorical in nature, but the symptoms of inattention and hyperactivity-impulsivity are expressed dimensionally, possibly at the extreme end of a continuum of ADHD behaviors (Knouse, Bagwell, Barkley, & Murphy, 2005; Levy, Hay, McStephen, Wood, & Waldman, 1997). Finally, the level of impairment caused by ADHD symptoms may differ between adults and children, and symptoms will likely affect additional domains in adults (e.g., marital, familial, occupational, driving, interpersonal) (Barkley et al., 2008; Davidson, 2008).

ADHD is well studied in children; unfortunately, much less is known about the disorder in adulthood, partly because *DSM-IV* (2000) criteria for ADHD in adults were designed and selected based on studies with children, specifically, elementary-school-age boys (Barkley et al., 2008; Davidson, 2008; Lahey et al., 1994; Spitzer, Davies, & Barkley, 1990). Consequently, the symptom criteria defined in the *DSM-IV-TR* (2000) do not reflect the experiences of most adults with ADHD (McGough & Barkley, 2004; Ramsay & Rostain, 2006; Rostain, 2008). Barkley et al. (2008) posited "The utility of extending [childhood criteria] to adults with ADHD is therefore an open question and should not automatically be assumed" (p. 170).

Proposed Changes for DSM-V

Moving into the *DSM-V* in 2011, specific diagnostic criteria for ADHD in adults are proposed. The problem with the current diagnostic criteria is that they are not reflective of adult experiences. McGough and Barkley (2004) stated that the *DSM-IV-TR* (2000) criteria are overly restrictive and fail to identify significant numbers of adults who

suffer meaningful levels of dysfunction. To increase diagnostic validity, Barkley et al. (2008) recommend new diagnostic criteria for ADHD in adults for the *DSM-V*. While the current *DSM-IV-TR* (2000) diagnostic criteria require six of nine symptoms, which fall into subtypes of inattentiveness, hyperactivity-impulsivity, or combined, the proposed *DSM-V* criteria consist of a single threshold for total symptoms with the cutoff for these symptoms being either four of the first seven or six of all nine. Barkley (2007) posited that the two symptom dimensions of inattentiveness and hyperactivity-impulsivity demonstrate a robust relationship, with more severe symptoms on one dimension being associated with the other. Barkley also posited that maintaining separate subtypes of the disorder is clinically misleading because individuals, including both children and adults, meeting criteria for the subtypes according to the *DSM-IV-TR* (2000), do not truly differ in any important respects.

Barkley and Beiderman (1997) also took issue with the precise age-of-onset criteria specified in the *DSM-IV-TR* (2000) as before 7 years, noting that it had no practical, theoretical, or empirical justification other than to simply suggest that ADHD was a disorder characterized by early-childhood onset. Approximately half of all clinic-referred adults meeting all other criteria for ADHD report an onset of their symptoms at age 7 years or later, and these adults do not differ in any important respects from those whose onset was before age 7 years (Barkley et al., 2008; Faraone et al., 2006). McGough and Barkley (2004) indicated that adults with ADHD, or adults not diagnosed until adulthood, and adults who were diagnosed with ADHD in childhood

(and their parents) simply cannot accurately recall the onset of symptoms with sufficient accuracy to justify the placement of so precise and so early an age of onset criteria into the diagnostic criteria. For these reasons, Barkley proposes an onset criterion of approximately 16 years of age for the *DSM-V*.

Barkley (2007) also questioned the utility of subtypes in the current diagnostic criteria in which the two symptom dimensions of hyperactivity-impulsivity and inattentive symptoms are used to create three subtypes of ADHD. Barkley noted that few differences have been found between the combined type, for example, and the hyperactive-impulsive type except that the latter group is often found to be younger and to have less severe symptoms and related deficits than those in the combined type. Lahey, Pelham, Loney, Lee, and Willcutt (2005) stated that these findings suggest that hyperactivity-impulsivity is likely a precursor to the combined type and that researchers studying the hyperactive-impulsive type have simply captured young children who will eventually go on to qualify for the combined type.

Another important point made by Barkley (2007) was that clarification is needed to specify more clearly what is meant by the terms *developmentally inappropriate* and *often* as applied to each *DSM* symptom. Barkley commented that if clinicians use developmental inappropriateness as a diagnostic indicator, then, the criteria itself should have different symptom thresholds for different developmental stages. Barkley indicated that the use of the term *often* is unclear insofar as it is unknown whether this refers to an absolute frequency of behavior or in relation to one's same-age peers.

Barkley recommended that this term should be used in reference to one's same-age peers. Barkley also questioned the utility of the term *impairment* because the *DSM* provides no definition of what is meant by impairment and offers no standard against which it is to be defined. Barkley, Fischer, Smallish, and Fletcher (2006) noted that symptoms reflect the cognitive-behavioral expressions of a disorder while impairment represents the consequences that occur as a result of demonstrating those symptoms. Barkley (2007) suggested that impairment should be considered as functioning that is below level relative to the average person in any domain of major life activity. For example, Barkley suggested that ADHD can be considered to be present if an individual's work history, social or financial functioning, driving history, or dating – cohabitating – marital history reflects subnormal functioning.

Regardless of the heterogeneity of the disorder and the complexity of accurate diagnosis, it is useful to consider the prevalence of ADHD in childhood and adulthood. Table 2 developed by Barkley (2007), reflects the proposed *DSM-V* criteria designed to reflect more accurately ADHD in adulthood.

Table 2 *Proposed DSM-V Criteria for ADHD in Adults*

A. Has six (or more) of the following symptoms that have persisted for at least 6 months to a degree that is maladaptive and developmentally inappropriate:

1. Often is easily distracted by extraneous stimuli or irrelevant thoughts
2. Often makes decisions impulsively
3. Often has difficulty stopping activities or behaviors when he or she should do so
4. Often starts a project or task without reading or listening to directions carefully
5. Often shows poor follow-through on promises or commitments he or she may make to others
6. Often has trouble doing things in their proper order or sequence

7. Often is more likely to drive a motor vehicle much faster than others (excessive speeding) [Alternate symptom for those adults with no driving experience: Often has difficulty engaging in leisure activities or doing fun things quietly]
8. Often has difficulty sustaining attention in tasks or play activities
9. Often has difficulty organizing tasks and activities

B. Some symptoms that caused impairment were present in childhood to adolescence (before age 16 years).

C. Some impairment from the symptoms is present in two or more settings (e.g., work, educational activities, home life, community functioning, social relationships).

D. There must be clear evidence of clinically significant impairment in social, educational, domestic (dating, marriage or cohabiting, financial, driving, child-rearing, etc.), occupational, or community functioning.

E. The symptoms do not occur exclusively during the course of a Pervasive Developmental Disorder, Schizophrenia, or other Psychotic Disorder, and are not better accounted for by another mental disorder (e.g., Mood Disorder, Anxiety Disorder, Dissociative Disorder, or a Personality Disorder).

Coding note: For individuals who currently have symptoms that no longer meet full criteria, "in partial remission" should be specified.

From *ADHD in Adults: What the Science Says*, by R.A. Barkley et al., 2008, New York, NY; Guilford Press. Copyright 2008 by Russell A. Barkley. Reprinted with permission.

Childhood Prevalence of ADHD

ADHD had previously been hailed as a diagnosis of childhood, beginning with its roots in the diagnostic criteria in the *DSM*, 2nd ed. (APA, 1968; Ramsay, 2010). Therefore, a notable limitation in the research literature pertains to the fact that the symptom criteria were developed specifically for children and do not accurately reflect the experiences of most adults with ADHD (McGough & Barkley, 2004; Ramsay & Rostain, 2006b, Ramsay & Rostain, 2008b). ADHD is a lifelong neuropsychiatric disorder marked by inappropriate developmental trajectories caused by the symptoms of the disorder. Klorman (2004) found that approximately 46% of diagnosed children continue to display symptoms into adulthood. Faraone et al. (2006) indicated that 35% of individuals surveyed were first diagnosed with ADHD in adulthood.

ADHD is the most widely researched and validated diagnostic category in child psychiatry. Childhood prevalence rates vary according to gender as a result of referral bias (Biederman, et al., 2005; Gaube & Carlson, 1997; Rasmussen & Levander, 2009). ADHD is a neuropsychiatric disorder affecting between 3% and 10% of the childhood population (Davidson, 2008; Mangeot, 2001). This discrepancy is likely related to research limitations, such as information obtained from a clinical versus community sample, criteria of the disorder being used, or subtype of the disorder being studied.

Palnczyk, Silva de Lima, Horta, Biederman, and Rohde (2007) estimated the worldwide prevalence of ADHD in children through systematic review and meta-regression analysis. The results indicated the worldwide pooled-prevalence of ADHD in children to be 5.29%. The authors of this study searched PsychINFO and MEDLINE databases from January 1978 to December 2005 and reviewed textbooks and reference lists of the studies listed. Authors of relevant articles and experts on Attention Deficit Hyperactivity Disorder / Hyperactivity Disorder (ADHD/HD) from North America, South America, Europe, Africa, Asia, Oceania, and the Middle East were contacted. The literature search generated 9,105 records, and 303 full-text articles were reviewed. In total, 102 studies comprising 171,756 subjects from all world regions were included. Interestingly, the worldwide pooled-prevalence of 5.29% of children with ADHD/HD was highly variable. In the multivariate meta-regression model, researchers found that diagnostic criteria, source of information, requirement of impairment for diagnosis, and geographic origin of studies were significantly associated with ADHD/HD prevalence rates. According to Palnczyk et al., (2007), "Geographic variability was associated with significant variability only between estimates from North America (approximately 6%) and both Africa (approximately 8%) and the Middle East (approximately 3%)." No significant differences were found between Europe and North America. These authors stated that the results of their study should be interpreted with caution because of the large variability found in all analyses.

Further, they concluded that geographic location played a limited role in the reasons for the large variability of ADHD/HD prevalence rates worldwide. Instead, they attributed the variability primarily to the methodological characteristics of the studies.

Adulthood Prevalence of ADHD

ADHD is considered to be a lifelong neuropsychiatric disorder that is usually first manifested in childhood or adolescence, with estimates of prevalence between 4% and 5% of the adult population (APA, 2000; Davidson, 2008; Kessler et al., 2006; Ramsay & Rostain, 2008). Cross-cultural research suggests that prevalence rates for ADHD worldwide are similar to rates identified in the United States. For example, Palnczyk et al. (2007) estimated the worldwide pooled-prevalence of ADHD in children to be 5.29%. The estimated worldwide prevalence rate for adults is approximately 3.4% (Adler, Barkley, & Newcorn, 2008).

The prevalence of ADHD in adults is difficult to determine because the diagnostic criteria in many epidemiological studies are based on the *DSM-IV-TR* (2000) criteria originally designed for children, who often present differently from adults (Rostain, 2008). Faraone and Biederman (2005) noted that estimates of the prevalence of ADHD in adults have typically been indirect, relying on three types of studies: longitudinal follow-up of children with ADHD into adulthood, community surveys using samples of convenience, and family studies of children with ADHD examining adulthood prevalence in the nonADHD comparison children.

Additionally, research that relies on retrospective accounts of childhood symptoms might be flawed from positive illusory biases in individuals with the disorder. Further, some symptoms of the disorder may be masked by the presence of comorbid conditions, and less severe cases of the disorder could be missed altogether.

Klorman (2004) noted that approximately 46% of children with ADHD continue to display symptoms of the disorder in adulthood. Even though the persistence of ADHD beyond childhood has been established, the extent of the diagnosis in adulthood is difficult to determine, but it is estimated to fall between 4% and 5% (Davidson, 2008). Results from the National Comorbidity Survey Replication study in 2006 revealed that the estimated prevalence of ADHD in adults was 4.4% (Kessler et al., 2006). The prevalence of ADHD in adults as interpolated from longitudinal studies of children with ADHD followed into adulthood is approximately 3.3% to 5.3%, whereas actual studies of large general-population samples have more recently placed the figure at nearly 5% of adults, representing more than 11 million adults in the United States alone (Barkley et al., 2008). These figures would not take into account any new cases of ADHD that could arise as a consequence of acquired neurological injuries rather than the common genetic form of the disorder (Nigg, 2006).

ADHD in adults is under-researched and not well understood. Of the diagnostic triad comprised of inattention, impulsivity, and hyperactivity, inattention is the most prominent symptom, seen in more than 90% of adults with the disorder, while hyperactivity is less often a problem (Davidson, 2008; Stern, Garg, and Stern, 2002).

One possible reason for the high prominence of inattentiveness in adults with ADHD is the developmental trajectory and natural course of the disorder (Barkley et al., 2008). Symptoms of hyperactivity tend to remit over time, for example, and are more likely to be reflected in adults as fidgetiness, the need to be active and constantly engaged in some activity, or a sense of cognitive restlessness (Mapou, 2006).

The core triad of symptoms applies to both children and adults, and the symptoms are both chronic and stable (Newton-Howes, 2004). Further, Newton-Howes (2004) stated that while there may be a reported reduction in symptoms with advancing age, this reduction might be explained by acquisition of cognitive strategies that individuals develop to ameliorate the symptoms of ADHD. Solden (2002) noted that although visible symptoms, such as hyperactivity, often decrease with age, adults with ADHD continue to struggle with inattention, impulsive behavior, and an ongoing sense of internal restlessness.

Gibbins et al. (2010) evaluated ADHD hyperactive-impulsive subtype in a large clinical sample of adults in what is considered to be the first study to evaluate the aforementioned subtype specifically. They examined 725 adults recruited from 84 different community-based treatment sites in Canada and the United States. ADHD symptoms were assessed via the Attention Deficit Hyperactivity Disorder Rating Scale for *DSM-IV* (ADHD-RS-IV), which is an 18-item, clinician-administered, semi-structured interview. Clinicians supplemented the ADHD-RS-IV with longitudinal, observational, and collateral information.

Their sample was comprised largely of women (51.5%) who were married (89.4%) and Caucasian (89.4%). Gibbins et al. (2010) found that 3.3% of their sample met criteria for a diagnosis of ADHD, hyperactive-impulsive subtype. Additionally, the hyperactive-impulsive group demonstrated higher ratings of inattentiveness (M = 18.74, SD = 6.32) compared to the inattentive subtype group (M = 18.50, SD = 5.24). The researchers stated that the hyperactive-impulsive subtype group in their study was not significantly different from the inattentive and combined-type subgroups, however, and they therefore questioned the existence of the hyperactive-impulsive subtype in adults given its rarity. Limitations of their study included the exclusion of those individuals with comorbid conditions from the sample, thus potentially representing a referral bias toward mild illness (Gibbins et al., 2010).

Solden (2002) posited that most of these adults have a sense that they are not fulfilling their true potential and are frustrated by demands of academic, work, or home life. Adults with ADHD may talk fast, interrupt others, do too many things at once, rush through activities, and act on impulses without adequate assessment of the consequences (Solden, 2002). Adults with ADHD often have more axis I comorbidities including substance abuse, dependence, depression, and anxiety, than does the general population. Adults with ADHD experience greater rates of academic and interpersonal problems than the general population. They are also more likely than the general population to be involved in car accidents and to receive speeding tickets.

Additionally, adults with ADHD may have greater sensitivity to failure and/or rejection and may have unrealistic expectations. The symptoms experienced by adults with ADHD also have a profound effect on the individual within the context of relationships and society. Simply stated, the lives of adults with ADHD appear to be more complicated than those of their nonADHD counterparts. Various issues arise between childhood-diagnosed adults with ADHD and clinic-referred adults with ADHD. Three landmark studies were conducted that underscore the differences between the disorder and age of diagnosis.

The Milwaukee Study

Barkley et al. (2008) conducted the Milwaukee Study, a longitudinal study of hyperactive children followed into adulthood. The hyperactive group (N = 158) and community control group (N = 81) were assessed at three time points: (1) beginning between 1979 and 1980, when the participants were 4 to 12 years of age, (2) between 1987 and 1988, when the participants were 12 to 20 years of age, and (3) from between 1992 and 1996, when they were at least 19 years of age. One of the purposes of the Milwaukee Study was to conduct a comprehensive, longitudinal study of symptom presentations of ADHD as it evolves into the adult life stage among adults who, as children, were clinic referred. They further subdivided this group into those who continued to meet criteria for the disorder versus those who did not. The original gender composition was 91% male and 9% female, while racial composition was 94% White, 5% Black, and 1% Hispanic.

The researchers also sought to determine the relative utility or predictive accuracy of the *DSM-IV-TR* (2000) symptoms; to determine the relative utility of specifying the age of onset by 7 years; to understand the other psychiatric disorders and psychological maladjustments most likely to be associated with ADHD in children growing up with the disorder who continue to have it in adulthood as compared with the two control groups (children who no longer qualify for the disorder and community control children); to examine impairments across major life activities; and to assess general cognitive and neuropsychological deficits associated with ADHD in adults who grew up with the disorder (Barkley et al., 2008).

Barkley et al. (2008) found that 100% of the hyperactive group at follow-up at age 27 years endorsed impairment in at least one of the following life domains: occupation (58.2%), home responsibilities (69.1%), social activities (52.7%), community activities (18.2%), educational activities (32.7%), dating or marriage (61.8%), and any domain (100%). Barkley et al. noted that individuals might have just rated their symptoms high; however, symptom-endorsement was likely an underestimate of actual functioning in life activities. Research suggests that children and adults with ADHD show a positive illusory bias in self-ratings of their competence and task performance, often rating themselves as functioning better than they actually do (Barkley & Murphy, 2006; Knouse et al., 2005). Collateral ratings of impairment measuring the same domains generally yield higher percentages of impairment than those of the self-reports.

Barkley et al. (2008) found that adults with ADHD who were diagnosed in childhood showed lower levels of comorbidity with other axis I psychiatric disorders than did clinic-referred adults. The reason for this difference may be related to referral bias in the latter group insofar as treatment-seeking adults often have higher risk of comorbid disorders than do those who are not seeking treatment (Barkley et al., 2008). In fact, Barkley et al. pointed out that, "This pattern implies that the older participants or patients are when they provide ratings of themselves about ADHD, particularly after their early thirties, the more likely are those reports to agree with the ratings provided by others" (p. 93). This statement suggests that positive illusory bias may diminish with age.

Milwaukee Follow-up Study

Barkley and Gordon (2002) conducted an 8-year follow-up study (The Milwaukee Follow-Up Study) of boys with ADHD between the ages of 12 and 20 years and compared them to a community control group. They found that individuals with ADHD began sexual activity at a younger age (15 vs. 16 years), had more sexual partners (19 vs. 7), evidenced higher rates of teenage pregnancy (38% vs. 4%), had higher numbers of offspring by age 27 years (51% had children compared to 13% of control group), and were more likely to have contracted a sexually transmitted disease (17% vs. 4%). Just as alarming, 10% had dropped out of school (vs. 0% controls), 29% had failed a grade (vs. 10% controls), 46.3% were suspended (vs. 15.2% controls), and 10.6% were expelled (vs. 1.5% of controls).

Based on these results, Barkley and Gordon hypothesized that adults with ADHD evidenced repeated and ongoing difficulties managing life problems because of deficits related to executive functioning.

The UMASS Study

In contrast to his study of adults with ADHD who were diagnosed in childhood, Barkley conducted a study of clinic-referred adults. Barkley et al. (2008) reported the results of one of the largest and most comprehensive studies of adults with ADHD, the UMASS Study, which compared clinic-referred adults with the disorder to both a control group of adults with other disorders seen at the same clinic and a community control group. One of the major aims of this study was to uncover which symptoms differentiate clinic-referred adults with ADHD from clinic-referred adults without ADHD and community controls. Clinic-referred adults with ADHD endorsed higher mean symptom ratings compared to those of clinical and community control groups regarding current functioning: inattentive symptom ratings (7.3%, 5.8%, and .3%, respectively); hyperactive-impulsive symptom ratings (5.1%, 3.8%, and .4%, respectively); and total ADHD symptom ratings (12.4%, 9.6%, and .7%, respectively).

Childhood recall of symptoms between the ages of 5 and 12 years was also assessed, and, not surprisingly, the clinic-referred ADHD adults endorsed higher mean ratings of symptoms compared to those of the clinical and community control groups: inattentive symptom ratings (7.4%, 4.5%, and .3%, respectively); hyperactive-impulsive symptom ratings (5.5%, 3.6%, and .6%, respectively); and total ADHD symptom ratings (12.9%, 8.1%, and .9%, respectively).

While it is evident from these findings that clinic-referred adults with ADHD consistently endorsed higher mean ratings of impairment compared to those of both groups, with inattentive symptoms being rated as highest, Barkley et al. (2008) examined the relative utility or predictive accuracy of these symptoms for adults with ADHD. The researchers' rationale was that current *DSM* criteria require six of nine symptoms of inattention or hyperactive-impulsive symptoms to qualify for the diagnosis; however, this threshold is based on analyses of children (Lahey et al., 1994). The findings indicated that 100% of the ADHD group endorsed three or more inattention symptoms whereas 98% of the community control group endorsed three or fewer symptoms of inattention. Additionally, 72% of the ADHD group endorsed three or more hyperactive symptoms whereas 100% of the community group endorsed three or fewer symptoms of hyperactivity-impulsivity.

Based upon these findings, Barkley et al. (2008) indicated that a threshold of just four symptoms on the inattentive or hyperactive-impulsive lists would appear to be a better diagnostic threshold than the now-recommended six symptoms because a threshold

of four symptoms effectively rules out 100% of the community control group. One problem with these findings is that 75% of the clinical control group also endorsed at least four or more inattentive symptoms and 52% endorsed four or more hyperactive-impulsive symptoms, which indicates that a threshold of four symptoms is potentially problematic insofar as differentiating ADHD from other clinical disorders. Barkley et al. (2008), however, clarified that the distinguishing marker in establishing an appropriate diagnosis of ADHD includes identifying that the patient's complaints are developmentally inappropriate. Barkley and Biederman (1997) argued that the current *DSM-IV-TR* (2000) age-of-onset criterion (age 7 years) for the disorder is without merit because this clear demarcation inaccurately asserts that there is a definitive nature for onset of the disorder, which is contrary to nearly all other disorders in the *DSM*.

Therefore, another major aim of the UMASS Study was to examine the current age-of-onset criterion. The researchers demonstrated that, overall, 53% of the ADHD group and 29% of the clinical control group had onset of symptoms of ADHD before age 7 years. Barkley et al. (2008) did not obtain this information from the community control group because they did not expect this group to have many symptoms. Their findings indicate that if clinicians strictly imposed the current age-of-onset criteria, nearly half of the UMASS Study sample would not have received an ADHD diagnosis despite meeting all other criteria. In addition to these major findings, the researchers also endeavored to explain issues related to the extent to which women with ADHD may differ from men specific impairment across major life activities, and comorbidity.

Because these domains are better developed areas of research in the field of ADHD in adults, the results of these aforementioned UMASS Study research questions are included in the respective sections of this literature review to follow.

Gender Differences in ADHD

The literature is inconsistent regarding the gender ratio of ADHD prevalence and is partly dependent on aspects of the data: childhood versus adult, reason for referral, and difference in clinical presentation of the disorder. Some outpatient psychiatry clinics that treat adults have reported a male-to-female ratio of 1:1 (Matas, 2006). Ramsay and Rostain (2005) noted that there is an emerging difference between clinic and community samples of children in terms of the gender ratio and described that in clinic-referred samples, male probands typically outnumber female probands from 8:1 to 10:1, depending on the study, whereas this ratio decreases in community samples of children, with male probands outnumbering female probands at a rate of about 3:1. The National Comorbidity Survey Replication Study found that ADHD in adults was significantly more prevalent among men than women, with a 1.6 male-female odds ratio, comparable to the odds ratio found in studies of children and adolescents (Kessler et al., 2006). Blum et al. (2008) determined that boys are four times more likely to have ADHD than are girls. In an epidemiological study of children and adolescent twins in Missouri, Neuman et al. (2005) found that 3.5% of girls and 7.5% of boys met criteria for ADHD.

Biederman et al. (2005) assessed 577 nonreferred siblings of children with ADHD (between ages 6 and 17 years) through structured interviewing and found that 11% of the girls met criteria for ADHD while 30% of the boys met criteria. When these groups were compared, prevalence of ADHD subtypes was equal, with the combined type being most common (60%). Interestingly, earlier research by Gaube & Carlson (1997) found that the groups did not differ with respect to comorbidity of internalizing or externalizing disorders. The researchers concluded, as a result of these findings, that the features of ADHD did not differ by gender and that previously detected differences were likely the result of referral biases, especially with regard to more severe behavioral disorders (Biederman et al., 2005).

The adult population with ADHD may include more women than men, with a possible explanation that many girls go undiagnosed in childhood because of the tendency of girls to be less disruptive than boys and, consequently, to go unrecognized until later in life (Doyle, 2006; Faraone, Biederman, & Friedman, 2000; Weiss, 2003). Women whose ADHD had gone undiagnosed in childhood commonly seek treatment after one or more of their children are diagnosed with the disorder and consequently note similar characteristics in themselves (Matas, 2006). For example, a meta-analysis by Gaube and Carlson (1997) suggested that girls tend to have lower levels of hyperactivity and higher rates of mood and anxiety problems, commonly referred to as internalizing symptoms, whereas boys have higher levels of hyperactivity and conduct disorder, commonly referred to as externalizing symptoms.

Although girls have a clinical presentation different from that of boys, both are at the same risk for adverse clinical outcomes (Doyle, 2006).

Rasmussen and Levander (2009) analyzed general background information, diagnostic history on the basis of the International Classification of Diseases–10 (ICD-10), social history, and symptom profiles of 600 previously never-treated men (N = 436) and women (N = 164) who resided in one of six catchment areas in Northern Norway. Of the 600 recruited subjects, 587 were accepted into their study. Thirteen subjects were excluded because they did not meet full ICD-10 criteria for ADHD. Rasmussen and Levander noted that the ICD-10 criteria are almost identical to the *DSM-IV-TR* (2000) criteria; however, diagnosis according to ICD-10 standards requires fulfillment of criteria within all symptom groups as well as manifestation of problems before age 7 years, thereby possibly limiting the number of people with the diagnosis. The researchers found that ADHD symptom intensity and subtypes did not differ between genders and stated that gender differences appear to be related to referral biases. They also found that symptoms measured by the hyperkinetic checklist in the ICD-10 confirmed the absence of any sex differences in symptom pattern or intensity of ADHD-related symptoms because they found that symptom load was unrelated to gender. A limitation of their study included the fact that all of their subjects were treatment-seeking patients, which may suggest that individuals suffering from less impairment were not represented in the sample. The researchers stated that their findings must be interpreted with caution for this reason.

For example, it has been noted in the literature that women may suffer from more inattentive-type related symptoms than men (Gaube & Carlson, 1997; Matas, 2006; Weiss, 2003), thus suggesting that women may have been underrepresented in their sample.

Rasmussen and Levander (2009) hypothesized that women have a different pattern of symptoms from men that is more dominated by inattention and less hyperactivity and that women have more comorbidity in the form of internalizing disorders, less alcohol and substance abuse, and lower capability to cope with the problems of daily life. While there are conflicting reports in the research literature regarding gender differences in the disorder, one of the major aims of Barkley et al. (2008) in the UMASS Study was to examine the extent to which women with ADHD may differ from men with the disorder, and they found no difference in the number of hyperactive, impulsive, or inattentive symptoms between genders. It is also possible that women self-refer more, and this sample may not have been representative of the greater population with ADHD.

Biederman et al. (2008) conducted a study to evaluate comprehensively the association between ADHD and major depression in adolescent and young adult female patients. They hypothesized that major depression in females-with-ADHD would be associated with more severe comorbidities and negative outcomes than would major depression in females-without-ADHD.

They found that clinic-referred females with ADHD had a 2.5 times higher risk for major depression at follow-up compared with females in the clinical control group. Major depression in females with ADHD was associated with an earlier age of onset, greater than twice the duration of the depressive episode, more severe depression-associated impairment, a higher rate of suicidality, and a greater likelihood of requiring psychiatric hospitalization than major depression in girls in the control group. Parental major depression and proband mania were significant predictors of major depression among females-with-ADHD, independent of other predictors. These authors concluded that major depression, emerging in the context of ADHD in females, is an impairing and severe comorbidity with a demonstrable genetic component. One limitation of this study is that the results may not generalize to nonreferred individuals with ADHD.

The gender discrepancy in childhood appears to be related to increased levels of hyperactivity and conduct problems more commonly detected in boys than in girls, thus creating the misperception that ADHD is a disorder restricted to males (Barkley et al., 2008; Faraone et al., 2008; Gaube & Carlson, 1997; Rasmussen & Levander, 2009).

Expression of ADHD Symptoms in Daily Life

While researchers have sought to understand ADHD across broad categories, such as gender, others have sought to understand ADHD as it occurs in daily life. Knouse et al. (2008) studied a nonclinical sample of adults with to uncover the expression of ADHD symptoms in daily adult life by using the experience sampling method (ESM).

The participants included 206 students enrolled in a general psychology course who received course credit for participation (75% female students & 25% male students). The participants were repeatedly prompted to complete assessments of their current experiences using Personal Digital Assistants (PDAs) at random intervals throughout the day for a period of 7 days. The researchers hypothesized that inattentive and hyperactive-impulsive symptoms would be associated with diminished positive and increased negative affect, greater distress in daily activities, and cognitive impairment. They discovered that inattention had a significant inverse relationship with positive affect in daily life whereas hyperactivity-impulsivity was not related to positive affect. Participants in the inattentive group endorsed higher levels of negative affect when they were alone compared to when they were with peers. Inattentive symptoms were associated with self-reported cognitive impairment in daily life; however, hyperactive-impulsive symptoms were not associated with "thought problems" (p. 658). Cognitive impairment typically manifests through academic difficulty, greater stress, and negative life events, as well as through diminished positive affect (Knouse et al., 2008). Individuals in the inattentive group were particularly more prone to cognitive distortions, which were defined as overestimation of competence or positive illusory bias, and to distortions in memory functioning in daily life. Inattention was significantly related to impairment in social functioning.

This research highlighted the manifestations of ADHD in adults in daily life and revealed the impairment associated with symptoms of inattentiveness as often potentially worse, than that associated with symptoms of hyperactivity-impulsivity on a day-to-day basis.

Impacted Life Domains of Adult ADHD

The heterogeneity of adults with ADHD is apparent, further complicating issues related to diagnosis and subsequently to treatment based on the limitations of the diagnostic criteria as they currently stand according to the *DSM-IV-TR* (2000). Owing to the complexity of the various aspects of the life domains in adults with ADHD, further review is warranted pertaining to specific problems that may impact quality of life including but not limited to economic, occupational, academic, interpersonal, marital, and driving domains.

Economic Problems

Although there appears to be limited research regarding money management in adults with ADHD, problems handling money could be anticipated, considering the poor impulse control and self-regulation problems associated with this group (Barkley et al., 2008). Barkley et al. (2008) described this issue in reference to the Milwaukee Follow-up Study, whereby they followed children diagnosed with ADHD to adulthood and found that although the ADHD group reported a lower average savings than that of the community control, this difference was not significant.

One limitation to that finding is that the children were followed only to age 21 years and therefore, there may not have been enough time between the transitions from childhood to adulthood to evidence a significant difference.

The results from the UMASS Study paint a much more vivid picture of the financial-management problems clearly found in clinic-referred adults with ADHD compared to clinical and community controls. Adults with ADHD reported more problems in eight of 12 areas of money management than did the community controls: trouble managing money (67% vs. 15%); difficulty saving money (65% vs. 18%); buying on impulse (62% vs. 12%); nonpayment of utilities, resulting in their termination (32% vs. 13%); missing loan repayments (57% vs. 27%); exceeding credit card limits (47% vs. 29%); having a poor credit rating (26% vs. 7%); and not saving for retirement (71% vs. 42%). In comparison to the clinical control group, more specific risks were associated with ADHD beyond outpatient referral status. These findings clearly demonstrate that having ADHD is associated with specific financial problems, likely related to difficulty delaying gratification as well as difficulty with organization and meeting deadlines.

Occupational Problems

Results from the UMASS Study indicated that clinic-referred adults with ADHD (30%) and clinical control groups (18%) reported more difficulty in getting along with others at work compared to community controls (7%) and had more difficulties with their behavior or work performance (53%, 50%, and 5%, respectively).

While Barkley et al. (2008) obtained these findings from employer ratings of the study participants, Kessler, Lane, Stang, and Van Brunt (2008) surveyed employees of a large manufacturing firm to assess the prevalence and correlates of ADHD in adults in the workplace. Kessler et al. estimated the current prevalence of ADHD in the adult workplace to be 1.9%**.** The purpose of the study was to determine the prevalence and workplace costs of ADHD in order to evaluate the possible return on investment for a workplace screening-treatment program for workers with ADHD. The rationale for conducting such research was related to the results obtained from the National Comorbidity Survey Replication in 2005, which documented that ADHD in adults is associated with more than 120 million lost workdays in the USA each year, with a human capital value of $19.5 billion (Kessler et al., 2005).

Kessler et al. (2008) noted that adults with ADHD exhibited a 4 to 5% reduction in work performance and estimated capital value related to lost work performance to be approximately $4336 annually per employee with ADHD. Controlling for comorbidity in this sample had only a modest effect when assessing for ADHD and workplace performance. Adults with ADHD had higher probabilities of at least one sick day per month and significantly elevated incidence of workplace accidents or injuries. The majority of the sample was male (70%), and the median age was 46 years. Blue-collar workers comprised 41.8% of the sample while 39.3% was comprised of white-collar workers. The highest prevalence of ADHD was found in the blue-collar workers (3.3%) compared to executives (.9%).

Interestingly, the employees at the firm studied by Kessler et al. (2008) worked in a flexible scheduling environment, and it is therefore possible (and salubrious) that adults with ADHD may self-select into occupations that allow for flexible scheduling. It is not possible to make this statement definitively, however, because the workplace prevalence of ADHD in the Kessler et al. study was still lower than the national estimates, which range from 4 to 5 %. In any event, the findings by Kessler et al. (2008) call into consideration the issue of relation between goodness of fit and ADHD symptoms. Also of importance are concerns related to typical length of employment in one particular setting, turnover, and the costs of retraining staff. In order to put this into perspective, the workplace costs of ADHD are even higher than those of depression on a per-worker basis (Kessler et al., 2005).

Although there are important monetary considerations for potential employers of adults with ADHD to consider, the issue of whether ADHD workplace screening should be instituted remains controversial. Barkley et al. (2008) commented on the controversy regarding the definition of the term *impairment* that has stemmed from increased requests for special accommodations under the Americans with Disabilities Act (ADA) in employment and high-stakes academic testing. Their view holds that, in alignment with ADA standards, impairment should be defined relative to the norm or average person and not relative to highly specialized individuals or to an estimate of one's general ability, such as IQ (Barkley et al., 2008).

Recent research has documented the profound negative effects of ADHD on occupational functioning; however, there is no research guiding career counseling or workplace support interventions (Ramsay, 2009). Overall, the occupational functioning and, subsequently, economic toll of ADHD in adults is staggering, and problems range from workplace impairment to unemployment. With such impairments in occupational functioning, economic problems are predictable in adults with ADHD.

Academic Problems

The same cognitive deficits that impair occupational functioning are impediments to academic success. Many adults with ADHD have experienced difficulties in the course of their elementary education that persisted even into postsecondary academics (Ramsay, 2009). Adults with ADHD, regardless of referral source, are impaired academically compared to those without the disorder, and fewer of those with ADHD attempt or complete college (Biederman et al., 2006). Ramsay and Rostain (2008) noted that in the case of an evaluation of an adult with ADHD, even if someone has earned an advanced degree, important details about the patient's performance in school might not be reflected in his or her educational attainment. For example, the Milwaukee Study (Barkley et al., 2006) found that at age 21-follow up, more than 3 times as many hyperactive than community control group members had been retained in grade at least once (42% vs. 13%) during their schooling or had been suspended from high school at least once (60% vs. 18%).

Hyperactive group members had completed fewer years of education and had a lower grade-point average (1.69 vs. 2.56 out of a possible 4.0) and class ranking (49th percentile vs. 69th percentile) in their last year of schooling (Barkley et al., 2008).

In contrast, Barkley et al. (2008) compared the educational functioning of childhood-diagnosed adults to clinic-referred adults in the UMASS Study and found that between 16% and 40% of clinic-referred adults had repeated a grade and as many as 43% had received extra tutoring at school. Barkley et al. suggested that when taken together, clinic-referred adults share some of the same academic difficulties as their childhood-diagnosed counterparts; however, clinic-referred adults tend to demonstrate higher intellectual levels, have higher graduation rates, are more likely to attend college, and have less likelihood of struggling with learning disabilities.

Interpersonal Problems

Underlying executive dysfunction and the belief system arising out of years of disappointment often impair social functioning in adults with ADHD. Adults with ADHD might experience difficulties in committed relationships, married and family life, and other settings requiring the appropriate use of social skills (Ramsay, 2010). It is usually not a lack of awareness of appropriate social skills, but the lack of timely and effective implementation of them (Ramsay, 2010).

This fact is complicated by research that suggests that children and adults with ADHD show a positive illusory bias in self-ratings of their competence and task performance, often rating themselves as functioning better than they actually do (Barkley et al., 2006; Evangelista, Owens, Golden, & Pelham, 2008; Knouse et al., 2005). Collateral ratings of impairment measuring the same domains yielded percentages of impairment higher than those in the self-reports. In a study by Hoza, Pelham, Dobbs, Owens, and Pillow (2002), individuals with ADHD overestimated their social competence versus same-age peers who demonstrated an underestimation of social competence .85 vs. -.15 in self-perception ratings compared to teacher-ratings of competence. This indicates both a deficit in social skills and a lack of insight to the fact that a problem even exists.

Marital Problems

ADHD in adults can have a negative effect on marital or other committed relationships (Ramsay, 2009). Partners without ADHD may interpret symptoms, such as forgetfulness, distractibility in conversations, and poor follow-through, as evidence of apathy, laziness, and lack of empathy in a relationship, in their partner with ADHD. With increasing severity of a partner's ADHD, additional stressors may include financial problems resulting from impulsive overspending, employment difficulties, and the effects of psychiatric comorbidity (Ramsay, 2009). Barkley et al. (2008) found in the results of the Milwaukee Study that, irrespective of ADHD type, individuals who continued to meet criteria for ADHD at follow-up rated marital quality as fair to poor (35%) in comparison to community control subjects (9%).

Marital quality was rated to be fair to poor by 4% of those who no longer met criteria for ADHD at follow-up. Spouses of adults with ADHD rated less marital satisfaction than did spouses of adults without ADHD (Barkley et al., 2008; Robin & Payson, 2002). Barkley et al. (2008) also found that women with ADHD were less likely to be married and that men and women with ADHD, regardless of age of diagnosis, reported overall poorer quality of dating relationships.

Driving Problems

Similar to their misappraisal of interpersonal skills, adults with ADHD are more likely than adults without ADHD to overestimate their driving competence, even though they engage in fewer safety behaviors and incur more citations and accidents (Knouse, et al., 2005). Within the first 2 to 5 years of independent driving, adolescents with a diagnosis of ADHD have nearly 4 times as many auto accidents as do community controls (average of 1.5 vs. .04), are more likely to cause bodily injury in such accidents, and have approximately 3 times as many citations for speeding as do young drivers without ADHD (Barkley, 2000). Additionally, the accidents they have are more than twice as costly in terms of dollar damages to property and also in terms of bodily injuries. Barkley (2000) noted that youths with ADHD were 4 times as likely as youths without ADHD to have been at fault in these accidents (48% vs. 11%). The most common citation adolescents with ADHD received was speeding, and the second most common was for failing to obey stop signals (Barkley, 2000).

Barkley explained that maladaptive driving behavior is related to impulsivity of individuals with ADHD.

Specific populations

Whereas specific life domains are clearly impacted by the disorder, prevalence rates of adults with ADHD seem to occur in higher numbers in specific populations, such as military, criminal, and nonprofessional.

Military

Krauss, Russell, Powers, and Li (2006) conducted a retrospective cohort study to evaluate the Department of Defense practice of allowing some individuals with a history of an ADHD diagnosis to enter military service. They found no difference between 539 recruits with a history of ADHD and 1,617 enlisted-recruit control participants who did not reveal health problems prior to enlistment in terms of retention, promotion, and mental-health outcomes. A staggering 72% of these participants either met criteria for ADHD or revealed a previous ADHD diagnosis. Limitations of this study include the disproportionately male and Caucasian sample that had achieved at least a high school education and were willing to disclose diagnostic information pertaining to ADHD. Additionally, the researchers determined that as many as 36% of young adults entering the military may have a history of mental-health problems. They reported that 71% of those who were discharged for undisclosed ADHD clearly had at least one other disqualifying comorbid condition (e.g., major depression, personality disorder, conduct disorder, learning disability, or drug dependence).

Enlistment in the military may be a confounding variable insofar as a military lifestyle is typically associated with being simultaneously highly structured and stimulating. These factors suggest that individuals with ADHD may be disproportionately more likely to self-select into the military and to find such an environment salubrious, considering the difficulties already known with regard to executive functioning and positive outcomes associated with environmental structuring. Occupational research pertaining to ADHD in adults, as previously mentioned, suggests that problems are more likely to occur in environments lacking the sort of structure and support attendant to the military. Given that the support of highly structured environments tends to create positive outcomes for adults with ADHD, it is not surprising that lack of adequate supports could potentially lead to undesirable behavioral outcomes.

Criminal

Barkley, Fischer, Smallish, and Fletcher (2004) found that at age 21 follow-up hyperactive adults had higher rates of committing a variety of antisocial acts and had been arrested for doing so than did community controls. Specifically, the hyperactive group rated higher than community controls on frequency of property theft (85% vs. 64%), disorderly conduct (69% vs. 53%), assault with fists (74% vs. 52%), carrying a concealed weapon (38% vs. 11%), and illegal drug possession (52% vs. 42%).

This information, obtained from the Milwaukee Study, was related to the severity of ADHD in childhood, adolescence, and adulthood after controlling for the contribution of both ADHD and severity of conduct problems at the earlier developmental period. Ridenour et al. (2002) found that adolescent drug use before 18 years of age significantly increased the risk of adult antisocial behavior. Torgersen, Gjervan, and Rasmussen (2006) had similar findings to those of Barkley et al. (2008) in a sample of 45 Norwegian adults with ADHD: High rates of arrests and sentencing (45%) were reported in a retrospective analysis of medical records of adults who presented at a psychiatric clinic. Biederman et al. (2006) found that, compared to community controls, adults with ADHD were significantly more likely to have been arrested (37% vs. 18%). of controls.

Nonprofessional

It is not surprising that adults with ADHD may be more likely to be employed as unskilled or nonprofessional workers. The Milwaukee Study obtained employer ratings of work performance at the young-adult follow-up assessment point and found that hyperactive participants were rated as performing significantly less well at work than were community control subjects (Barkley et al., 2006). Not surprising, then, was the finding that adults with ADHD reported more frequent job changes and poorer job performances than those reported by control adults (De Quirnos & Kinsbourne, 2001). Results from the Milwaukee Study follow-up indicated that childhood-diagnosed adults reported lower job status and fewer current working hours per week than those reported by control adults.

Neuropsychological findings

Many of the difficulties previously enumerated may be understood, in part, as stemming from neurological findings often found in adults with ADHD. ADHD is a highly heritable developmental disorder of impaired executive functions (Ramsay & Rostain, 2008b). The areas of the brain that are affected are associated with planning, foresight, initiating and sustaining attention, and self-control; therefore, when these areas of the brain are impacted, the result is significant problems with functioning effectively in daily life over time and across situations. Neuropsychological testing plays a meaningful role in the assessment of ADHD (Davidson, 2008). It is most beneficial when the results are used to support conclusions based on history, rating scales, and analysis of current functioning (Davidson, 2008). Neuropsychological assessment is most sensitive to ADHD when it incorporates multiple, overlapping procedures measuring a broad array of attentional and executive functions (Davidson, 2008).

In a study by Dowson et al. (2007), 59 adults with *DSM-IV* (1994) diagnoses of ADHD completed questionnaires related to aspects of severity of ADHD. Associations were examined between questionnaire ratings and performance on a computer-administered task of spatial working memory. The correlation between ratings of ADHD and spatial working memory indicated moderate and significant correlations for patients' ratings but not for informants' ratings.

The authors concluded that aspects of impulsivity, including excessively emotional behavior and self-harm behavior, demonstrated relatively strong inverse associations with spatial working memory performance in these adults, thus demonstrating that there are clear neurobiological substrates identified in ADHD despite the clinical heterogeneity of ADHD populations. That spatial working memory was found to correlate negatively to impulsivity in Dowson et al.'s (2007) study further bridges the gap toward greater neuropsychological understanding of the role of impaired executive functions in individuals with ADHD.

According to Barkley (2000), ADHD is not primarily a disorder of the ability to pay attention but one of self-regulation. Barkley (2007) noted that inattentiveness is highly correlated with other items, scales, and neuropsychological tests that reflect executive functioning, especially working memory (Nigg, Hinshaw, & Huang-Pollack, 2005; Stavro, Ettenhofer, & Nigg, 2007). Barkley et al. (2008) proposed that executive functions are human, self-directed actions of self-control that an individual uses to alter a subsequent behavior so as to control future consequences. They defined the list of executive functions most associated with the frontal lobes of the brain as the following: (1) inhibition; (2) sensing to the self, especially visual imagery (nonverbal working memory); (3) speech to the self (verbal working memory); (4) self-regulation of emotion and motivation via emoting to the self; and (5) self-directed play, or analysis and synthesis (generativity, fluency, problem solving, or planning).

These neurological deficits lend credibility to the impulsivity observed in adults with ADHD.

Comorbidity

It is estimated that 70% to 75% of adults with ADHD who enter treatment meet criteria for at least one additional condition (Ramsay & Rostain, 2008b). Diagnosing ADHD in adults requires careful consideration of differential diagnoses, as it can be difficult to differentiate ADHD from other conditions, including major depression, bipolar disorder, generalized anxiety disorder, obsessive-compulsive disorder (OCD), substance abuse or dependence, personality disorders, and learning disabilities (Davidson, 2008), all of which may impair attention and concentration. In adults, the most common comorbid disorders are mood disorders, anxiety disorders, substance use disorders, and antisocial personality disorder (Matas, 2006). Further, adults with ADHD who were diagnosed in adulthood may experience increased incidence of comorbid axis I conditions (Barkley et al., 2008).

Results of the UMASS Study indicated that clinic-referred adults with ADHD showed higher rates of comorbidity with axis I conditions than those of childhood-diagnosed adults (Barkley et al., 2008). The researchers hypothesized that the reason for this could be related to referral status, meaning that treatment-seeking adults often have a higher risk of comorbid conditions than do individuals who do not seek treatment.

Thus, comorbidity may be related to referral status insofar as increased severity of problems inherent to axis I pathology may lead to increased help-seeking behavior even in individuals with this chronic condition. Individuals experiencing decreased comorbidity, or fewer problems, might not be expected to seek treatment simply because they may not be prone to distress levels that would be expected of individuals with an increased number of disorders.

Barkley (2008) noted that "children with ADHD, even if they retain their ADHD into adulthood, show lower levels of comorbidity with other specific axis I psychiatric disorders than do adults with ADHD seen in clinics" (p. 219). Barkley further commented that most children growing up with ADHD, in contrast to clinic-referred adults with ADHD, do not seek treatment as adults because of their lack of recognition or acceptance that they have a disorder "once they leave their parents' home" (p. 6). Self-referred adults may have greater psychological awareness of the condition and impairments, which lead them to seek treatment.

Diagnosing ADHD in adults requires careful consideration of differential diagnoses, as it can be difficult to differentiate ADHD from other axis I and axis II conditions, including major depressive disorder, dysthymia, bipolar disorder, generalized anxiety disorder, (OCD), substance abuse or dependence, personality disorders (borderline and antisocial), learning disabilities, oppositional defiant disorder (ODD), conduct disorder (CD), and Post Traumatic Stress Disorder (PTSD) (Barkley et al., 2008; Davidson, 2008; Goldsby, 2006; Schatz & Rostain, 2006).

The correlation between ADHD in adults and comorbid axis I and axis II conditions is stronger in females than in males. Girls with ADHD had a greater risk of psychiatric admissions in adulthood, and this risk was significantly increased if they also had a history of conduct problems (Dalsgaard, Mortensen, Frydenberg, & Thomsen, 2002). An astonishingly high percentage of clinical populations have comorbid ADHD. Psychiatric comorbidity is often higher in adults with ADHD than in nonADHD community controls (Fischer, Barkley, Smallish, & Fletcher, 2002).

The features of ADHD in adulthood, including comorbidity issues, require clarification if the field of psychology is to understand how the disorder affects the individual's ability to function in society. Adults with ADHD appear to have commonly co-existing or comorbid psychiatric disorders that complicate assessment and treatment (Ramsay, 2010). ADHD and comorbid disorders have been estimated to be 25% to 50% of clinical populations. In fact, researchers noted that antisocial personality disorder is often an associated adult outcome in a large minority of those children or adolescents who have both ADHD and CD and remarked that it is not surprising that 7% to 44% of clinic-referred adults diagnosed with ADHD also meet diagnostic criteria for this personality disorder (Barkley et al., 2008). According to Davidson (2008), the majority of adults with ADHD have at least one additional psychiatric disorder.

Individuals diagnosed with ADHD in childhood are at risk for developing comorbid conditions, some of which are likely secondary to ADHD-related frustration and failure (Davidson, 2008). Steffany, Fredman, Martin, and Korn (2001) suggested that comorbid conditions should be considered simultaneously with the diagnosis of ADHD instead of within the hierarchical format delineated by the *DSM-IV*.

Faraone et al. (2006) suggested that approximately 35% of ADHD cases in adults are of individuals who first received a diagnosis in adulthood. Fischer et al. (2002) found that in a study of clinic-referred children followed to adulthood (mean age 20-21 years: 13+ year follow-up), young adults with ADHD experienced nonsubstance-related comorbid psychiatric disorders at a rate of 59% compared to 36% in community control subjects These authors also found that adults with ADHD experienced personality disorders, such as passive-aggressive (18%), histrionic (12%), borderline (14%), and antisocial (21%), at rates higher than those of community controls, as well as rates of major depressive disorder (26%) higher than those of the community control group at follow-up. Additionally, Fischer et al., (2002) found that adults who evidenced higher hyperactivity and conduct problems as children tended to display greater antisocial behavior as adults than those who had only one disorder in childhood.

Overall, a significant gap exists in the literature regarding comorbid disorders and diagnoses of ADHD in adults. Goldsby (2006) conducted a retrospective study analyzing 601 charts of adult patients, ages 18-65 years, with a primary axis I diagnosis of ADHD.

Results of this study indicated that comorbidity prevalence rates were 64%, approximately two thirds of the entire study. Six comorbid diagnoses were identified and in descending rank order were Major Depressive Disorder (MDD); Bipolar Disorder (BPD); Substance Abuse; Generalized Anxiety Disorder (GAD); Panic Disorder (PD), and Post Traumatic Stress Disorder (PTSD). This researcher identified and categorized two ADHD subtypes in this study and defined them as either "ADHD with Hyperactivity" or "ADHD without Hyperactivity." The results of the study indicated that the population was diagnosed as having ADHD with hyperactivity two thirds more often than without hyperactivity. The ADHD group with hyperactivity had at least double, or more than double, the rates of comorbidity than the group without hyperactivity. Women were found, overall, to have more comorbid conditions than men.

Major Depressive Disorder (MDD)

Goldsby (2006) found that MDD was diagnosed more frequently in females with ADHD but that there was a high prevalence rate for both genders in adults diagnosed with ADHD. Torgersen et al. (2006) reported a lifetime prevalence of 53% and current prevalence of 9% for major depression in adults with ADHD in a Norwegian sample of adults. McGough et al. (2005) examined a group of parents with ADHD who had children with ADHD and found greater mood disorders in the ADHD group than in their comparison group without ADHD. Barkley et al. (2008) stated that the association of ADHD with CD or antisocial personality likely mediates the link between ADHD and major depression.

Barkley et al. (2008) found that childhood-diagnosed adults with ADHD demonstrated a 27% prevalence of major depression by young adulthood. They also found that these clinic-referred adults were 3 times more likely to have, or at 37% greater risk for dysthymia than were those in the clinical control group. McGough et al. (2005) conducted a study of parents with ADHD who had children with ADHD and found greater mood disorders in this group than in their comparison group.

Bipolar Disorder (BPD)

Goldsby (2006) found that (BPD) was found in higher prevalence in male than in female adults with ADHD. Of note, Goldsby operationalized the term *Bipolar* to indicate alternating episodes of mania and depression and did not make a distinction regarding whether the participants met criteria for Bipolar I or Bipolar II in the study. Biederman (2004) reported an elevated risk of BPD in clinic-referred adults. Torgersen et al. (2006) reported a lifetime prevalence of 7% for the disorder and 2% for current prevalence in a sample of Norwegian adults. Barkley et al. (2008) noted that the relationship of ADHD in adults to BPD has not been well studied. Findings from the UMASS Study indicated that lifetime prevalence of clinic-referred adults with ADHD was 3% compared to 0% in the community control participants. According to the American Psychiatric Association (2000), “The lifetime prevalence of Bipolar I Disorder in community samples has varied from 0.4% to 1.6%” (p. 385). In addition, “community studies suggest a lifetime prevalence of Bipolar II Disorder of approximately 0.5%” (APA, 2000, p. 395).

Overall, Barkley et al. (2008) stated that "The relationship of ADHD to BPD in adults is open to doubt; it is in need of more research before some confidence can be placed in this pattern of comorbidity" (p. 208).

ADHD and Anxiety

Obsessive Compulsive Disorder (OCD) is an anxiety disorder that is often comorbid with ADHD. Schatz and Rostain (2006) stated, "Impaired functioning of the caudate may lead to dysregulated thalamic gating, which causes increased activity in the orbitofrontal cortex, leading to the obsessive thoughts seen in the disorder. The repetitive actions may be an expression of compensatory striatal activity" (p. 144). Other theorists, Bradshaw and Sheppard (2000), have argued that lateralization of brain function is dysregulated in both OCD and ADHD. Barkley et al. (2008) argued, however, that OCD does not appear to be significantly associated with ADHD in clinic-referred adults unless Tourette's syndrome or tic disorders are also present and added that there seems to be no elevated risk for OCD among adults with ADHD.

Barkley et al. (2008) noted that there is some inconsistency in findings concerning the comorbidity of ADHD in adults with anxiety disorders but that the weight of the evidence favors some association. Schatz and Rostain (2006) noted, "A notable flaw in much of the ADHD literature regarding children is that the diagnoses of anxiety and ADHD are often based on teacher and parent ratings**.**" The authors note that use of teacher and parent ratings is problematic because external ratings of a child's anxiety is likely not reliable and it may underestimate symptom prevalence.

Schatz and Rostain (2006) examined the differing assumptions regarding ADHD and comorbid anxiety by looking at the recent literature on the role of clinical anxiety. They reported, "Although anxiety may decrease impulsive action, it may also remediate the cognitive deficits seen in ADHD" (p. 142). Barkley et al. (2008) stated that the relationship between ADHD in adults and anxiety disorders in adults is inconsistent in past research. Torgersen et al. (2006) found that 13% of their adults with ADHD had lifetime panic disorder and 18% had lifetime social phobia, compared to prevalence rates of as high as 3.5% and 13%, respectively, in community populations (APA, 2000).

Substance Abuse and Dependence

Given the distress and frequent comorbidities attendant to ADHD, the high rates of substance abuse are not surprising in this population. There is a relationship between ADHD and both substance abuse and dependence. Substance abuse and dependence are known to occur to a more frequent degree among hyperactive children or children with ADHD who develop CD by adolescence or antisocial personality disorder by adulthood (Barkley et al., 2008; Tercyak, Peshkin, Walker, & Stein, 2002). Kollins, McClellan, and Fuemmeler (2005) found that cigarette smoking has an association with increased symptoms of ADHD in a general population sample of adults. Wilens (2004) reported that the highest risks for substance-use disorders appear to be among those adults with ADHD who also may have comorbid CD, antisocial personality disorder, or BPD.

Barkley et al. (2008) stated that CD or antisocial personality disorder likely mediates the link between ADHD and substance-use disorders. Torgersen et al. (2006) found that 45% of their sample of 45 adults with ADHD in Norway had lifetime alcohol abuse (33% currently), 51% cannabis use (36% currently), 49% amphetamine use (33% currently), and 16% opiate use (4% currently).

Treatment of ADHD

Given the complications of comorbidities in adults with ADHD, the need for evidence-based treatment is clear. A common starting point for ADHD treatment involves confirming the diagnosis and providing psycho-education (Ramsay, 2009). In fact, Ramsay (2009) emphasizes that communicating to the patient an accurate diagnosis of ADHD and confirming that the difficulties encountered by a patient result from a neuro-developmental syndrome and are not evidence of a "character flaw" could be considered the foundational cognitive intervention in treatment. A grief reaction to the diagnosis is not uncommon (Ramsay, 2009; Solden, 2002). Barkley et al. (2008) advised that proper treatment planning requires clinicians to be aware of and specifically assess for the high comorbidity of ADHD with other psychiatric disorders, particularly dysthymia, depression, ODD, and CD, and alcohol-use and drug-use disorders more generally, that can complicate treatment. They further cautioned that to ignore ADHD during the treatment of these disorders is highly likely to result in recurrent treatment failures owing to the significant self-regulation and executive deficits identified with the disorder (Barkley et al., 2008).

Cognitive Behavioral Therapy (CBT)

A focus on cognitive and behavioral modification supports metacognitive skill training, as often negative thoughts, feelings of frustration, and procrastination behaviors interfere with the implementation of coping skills. CBT strategies provide a coping scaffolding to counteract these tendencies (Ramsay, 2009). Essentially, CBT assists the client in identifying and building upon effective skills tailored to the individual's strengths. Moreover, CBT is an effective treatment approach with which to address the common comorbid mood, anxiety, or substance-use problems (Ramsay, 2009). In fact, reducing comorbid symptoms may help to improve overall functioning and foster resilience, thereby allowing patients to better focus on coping with ADHD (Ramsay, 2009).

Adults with ADHD seek treatment. In addition to pharmacological intervention, CBT is the cornerstone of effective treatment of ADHD symptoms. Identifying and understanding the various cognitive, behavioral, emotional, and functional manifestations of ADHD in a personalized way helps to demystify various life problems and to develop targets for treatment (Ramsay, 2009).

Typical presenting problems include residual symptoms of ADHD, ongoing functional impairment, nonresponse to medication or intolerable side effects, comorbidity, insufficient coping skills, and negative belief symptoms affecting life options and coping. Additionally, such patients often face substance abuse, sensitivity to failure and rejection, and unrealistic expectations.

Standard mechanisms of change in psychosocial treatments for adult ADHD include a focus on the development of coping strategies and metacognitive skills (e.g., organization, time management) (Ramsay, 2009). The current trend in the literature suggests that optimal treatment for individuals with ADHD includes CBT and medication management (Barkley et al., 2008; Ramsay & Rostain, 2008).

Medication

One of the most controversial aspects of the diagnosis and treatment of ADHD, especially in children, has been the use of stimulant pharmacotherapy. Despite the compelling anecdotal and research evidence to support the efficacy of stimulants as part of treatment, the use of psychoactive medication has contributed to the controversy surrounding the disorder itself. Controversy regarding diagnosis and subsequent treatment is not unique to ADHD, as BPD has a similar legacy. For example, there was a time in the history of psychiatry when it was controversial to diagnose a child with BPD because the disorder was presumed to affect only adults (Hallowell & Ratey, 2006). With research and increased understanding, now commonly accepted that children also suffer from BPD because the disorder is neuropsychiatric in nature. Therefore, while the general public and medical communities alike are still undereducated about ADHD as a disorder of childhood, it seems hopeful that with increased understanding of the disorder as neuropsychiatric, as with BPD, there will be increased acceptance of the legitimacy of ADHD and its subsequent treatment.

The controversy regarding the use of stimulant medication in children is long-standing, however. An important consideration as this issue pertains to adults with ADHD includes those who had been treated with stimulant medication as children and have been weaned off of stimulant medication as adults. This may occur because most stimulant medications are licensed for use only in children and because stimulant-medication treatment typically stops in adulthood (Newton-Howes, 2004). The effectiveness of pharmacotherapy in the treatment of ADHD in adults is well established; however, most adults with ADHD who are in treatment will require more than psychotherapy alone (Ramsay, 2009). While medication is certainly not the only option for adults with ADHD, it is simply a more developed area of research at this time, especially in more severe cases. Commonly prescribed ADHD medications include Concerta, Ritalin, Adderall, and Strattera.

Minnesota Multiphasic Personality Inventory (MMPI)

The original MMPI was published in 1943 by Starke Hathaway and J. Charnley McKinley. Hathaway and McKinley, both working at the University of Minnesota Hospital, believed that a group-administered, paper-and-pencil personality inventory would provide an efficient way of arriving at diagnostic labels (Graham, 2000). The test authors used the empirical keying approach to construct the MMPI scales test items. The empirical keying approach requires empirical determination of items that differentiate groups of persons. In other words, items were included in a scale if they empirically differentiated between diagnostic criterion groups.

Essentially, this empirical approach surpassed the limitations of the more commonly used logical keying approach, which was subjective and determined by face validity (Graham, 2000).

After constructing the basic clinical scales through qualitative review of personality-type statements from sources, such as psychological and psychiatric case histories, textbooks, and earlier published scales of personal and social attitudes, Hathaway and McKinley decided upon 504 statements they deemed to be relatively independent of one another. Two criterion groups were used in constructing the original MMPI, the Minnesota "normals," or the reference group, and the clinical participants**.** The Minnesota normal group was comprised of 724 relatives and visitors of patients in the University of Minnesota Hospital, 265 recent high-school graduates who were attending precollege conferences at the University of Minnesota, 265 Work Progress Administration workers, and 254 medical patients at the University of Minnesota Hospital. The clinical participant group, divided into discrete diagnostic subgroups, included 221 patients representing all of the major psychiatric categories in use at the time (Graham, 2000). For example, the clinical subgroups formed were hypochondriasis, depression, hysteria, psychopathic deviate, paranoia, psychasthenia, schizophrenia, and hypomania. Hathaway and McKinley enhanced sensitivity of the test by conducting item analysis, which resulted in the development of the MMPI scale for each corresponding clinical group. Over time, additional scales were added, including the Masculinity – Femininity (Mf) scale and the Social Introversion (Si) scale (Graham, 2000).

Hathaway and McKinley developed four validity scales designed to capture deviant test-taking attitudes. These scales include the Cannot Say (?) score, the Lie Scale (L), the Infrequency Scale (F), and the Correction Scale (K). The Cannot Say (?) score is simply the number of omitted items (including items answered both true and false). The Lie Scale was designed to capture an individual's unwillingness to admit to minor shortcomings or attempts by an individual to present himself or herself in a favorable manner. The Infrequency Scale (F) was designed to detect individuals whose approach to the test-taking is different from that intended by the test authors (Graham, 2000). For example, significant F scores may indicate exaggerated protocols or reflect a test-taking style consistent with "faking bad." Individuals with high F scores (T equal to or greater than 100) tend not to have a strong motivation to achieve, are easily frustrated, and tend to give up easily. They may also have short attention spans and poor judgment. The Correction Scale, developed by Meehl and Hathaway (1946), was designed to reflect and statistically correct for defensive test-taking attitudes.

The number of studies examining the MMPI-2 profiles in individuals with ADHD is a limited. Downey, Stelson, Powerlau, and Giordani (1997) found that adults with ADHD had clinically significant elevations on the following scales: depression (scale 2), psychopathy (scale 4), psychasthenia (scale 7), and schizophrenia (scale 8).

These researchers also found that adults with ADHD and comorbid disorders scored significantly lower than adults with ADHD alone on a scale of defensiveness (scale F). Additionally, approximately half (47.4%) of the adults with ADHD in the study were diagnosed with either a concurrent axis I anxiety or a depressive disorder. Individuals with ADHD but without comorbid psychological conditions comprised 53% of the study participants and were not significantly different from participants with ADHD and comorbid psychological conditions; however, significantly more participants with ADHD and comorbid psychological conditions met diagnostic criteria for ODD in childhood. The group with ADHD and comorbid psychological conditions scored higher than the pure ADHD group on all MMPI-2 clinical scales except for mania.

Coleman et al. (1998) compared the MMPI-2 profiles of three groups: patients with ADHD, patients with schizophrenia, and a healthy control group. The ADHD group demonstrated profiles similar to those of the schizophrenia group in reference to elevations on the major clinical and validity scales but with less symptomatology. Coleman et al. found that the Schizophrenia (Sc) scale most clearly differentiated the schizophrenia group from the ADHD group and controls; however, no single scale elevation clearly differentiated the ADHD group. The ADHD group scored significantly lower than the schizophrenia group only on the scales of schizophrenia and paranoia. The two scales on which the ADHD group scored highest were Depression and Psychasthenia, while significantly elevated in comparison to the control group, was in the subclinical range.

Both participants with ADHD and participants with schizophrenia also scored higher than controls on Si, a measure of social discomfort, maladjustment, and self-criticism. The authors related this finding to the negative social consequences of ADHD, which may lead to interpersonal tension and lowered self-esteem.

Robin, Tzelepsis, and Bedway (2008) suggested that these two studies indicate overall elevations for adults with ADHD on most MMPI-2 scales, especially when the patients have comorbid conditions. They also stated that further research is needed to determine whether an ADHD profile can be determined reliably on the MMPI-2 because although overall elevations were found, the elevations were still subclinical.

Chapter Three: Hypotheses

Hypothesis One

The first hypothesis proposed that there would be a higher prevalence of ADHD in patients presenting for Gastric Bypass (GB) than in the general population. This is supported by the research of Altfas (2002) who found that 27.4% of patients with obesity presenting for GB met criteria for ADHD, while 42.6% of individuals with a BMI greater than 40, considered morbidly obese, met criteria for ADHD.

Hypothesis Two

The second hypothesis assumed that certain executive-functioning deficits would correlate with specific clinical conditions. This hypothesis was based on the assumption that problems related to specific patterns of inattentiveness, hyperactivity, restlessness, impulse control, self-concept, and overall *DSM-IV-TR* (2000) diagnostic criteria related to inattention, hyperactivity-impulsivity, and total ADHD symptoms would correlate differentially with various clinical conditions.

Table 3 presents a summary of the two study hypotheses, rationale for each hypothesis, and respective formula for operationally defining the variables.

Table 3

Hypotheses Summaries

Hypothesis	Rationale	Formula
H1: There will be a higher prevalence of ADHD in patients seeking GB than in the general population.	Preliminary research suggests that a higher prevalence of ADHD exists in a population of patients seeking GB.	Clinical levels of ADHD measured by CAARS compared to the prevalence of ADHD in the general population. Correlation.
H2: Certain executive-functioning deficits will correlate with certain clinical conditions.	Patients seeking GB are at increased risk for psychological problems.	CAARS subscales with subscales on the MMPI-2 clinical scales. Correlation.

Note. Clinical levels of ADHD = T-Score of 65 or greater on the CAARS. Clinical levels of psychological conditions = T-score of 65 or greater on the MMPI-2.

Chapter Four: Methods

Design and Design Justification

This study endeavored to validate empirically the prevalence of ADHD and other psychological traits in patients seeking GB because of the paucity and limitations of the existing literature on the topic (Altfas, 2002). This study included archival data collected from individuals in the Atlanta, Georgia, area. Identifying information was not used in order to protect participant confidentiality.

Participants

Participant data were obtained from retrospective chart analysis of 100 consecutive morbidly obese patients evaluated by Dr. Steven Walfish in Atlanta, Georgia, for consideration of GB surgery. Dr. Walfish previously obtained informed consent and conducted psychometric testing and diagnostic interviewing with these patients. Patients were 18 years or older and presented for preoperative assessment for GB surgery. They completed a diagnostic interview and psychometric testing, including the MMPI-2 and the CAARS. No identifying information was collected on the participants, though basic demographic data for each patient were provided by Dr. Walfish.

Inclusion Criteria

Inclusion criteria included the following:

- At least 18 years of age
- Actively seeking GB surgery
- BMI of 40 or greater

- Compliance with physician's recommendations for treating pre-existing medical problems, if applicable
- Compliance with physician's recommendations to manage active or chronic psychiatric disorder, if applicable
- Must not be actively psychotic
- Must not be actively suicidal or homicidal
- Must have a history of previous attempts to lose weight

Exclusion Criteria

There were no exclusion criteria other than procuring a valid MMPI-2 protocol.

Informed Consent

Informed consent was previously obtained and part of standard procedures at the office of Dr. Steven Walfish.

Demographics

Demographic data, including age, gender, marital status, and ethnicity, were obtained from the existing data.

Measures

MMPI-2

Although the original MMPI was a highly regarded and widely used instrument in both inpatient and outpatient settings, it had not undergone revision for decades since its original publication, and there were concerns about the original standardization sample (Graham, 2000).

Specifically, general consensus was that contemporary standards had changed and that the original language and references used in the development of the original were simply no longer applicable. Additionally, the original had never undergone an editorial review, so there were grammatical and punctuation errors. These factors led to the inception of the Restandardization Project of the MMPI. Essentially, the primary goal of the project was to collect a contemporary normative sample that would be more representative of the general population than had been true of Hathaway's original sample (Graham, 2000). Efforts were also focused on rewriting, deleting, and generating new items. Major revisions of the existing validity and clinical scales were not part of this project. The publication of the MMPI-2 in 1989 reflected a more representative sample of the general population than did Hathaway's original sample, and the restandardization sample was a very close approximation of the current U.S. population, despite small demographic differences, which were determined to be insignificant (Graham, 2000). The final version of the MMPI-2 is comprised of 567 items. The MMPI-2 demonstrates adequate reliability and validity, with internal consistency coefficients ranging from .34 (scale 6) to .87 (scale 7) and test-retest coefficients ranging from .58 (scale 6) to .91 (scale 0) (Butcher, Dahlstrom, Graham, Tellegen, & Kaemmer, 1989). Cut-off T-score elevations were used to interpret the clinical scales on the MMPI-2. For example, T-score elevations of 65 and above are traditionally considered high or clinically significant.

Conners Adult Attention Deficit Disorder Rating Scale (CAARS)

The CAARS was designed to assess core symptoms of ADHD and related problems in adults 18 years of age and older (Solanto, Etefia, & Marks, 2004). This measure allows for *DSM-IV* (1994) oriented inattention, impulsivity, and hyperactivity scores in addition to emotional lability and problems with self-concept (Rosler et al., 2006). There are separate forms for self-report (CAARS-SR) and observer-report (CAARS-OR), and both types have a long, short, and screening version (Rosler et al., 2006; Solanto et al., 2004). The psychometric properties of the instrument, including internal consistency, different aspects of validity, and reliability, have been determined in detail (Rosler et al., 2006). For example, internal reliability coefficients for the subscales in the normative sample ranged from .88 to .91 across groups and scales while test-retest reliability ranged from .80 to .91 across scales (Solanto et al., 2004). Discriminant validity was assessed on a sample of 39 adults with ADHD and 39 nonclinical adults, yielding a highly significant group difference in the mean raw score (25.66 vs. 10.49, respectively; $SD = 7.92$) (Solanto et al., 2004). Overall correct classification rate was 85%.

The long form has 66 items and 8 subscales. Raw scores are converted to T scores based on norms for gender and 10-year age interval obtained from a sample of 839 adults (Solanto et al., 2004). Factor analysis in the standardization sample yielded a four-factor solution (Inattention / Executive Functioning; Hyperactivity / Restlessness; Impulsivity / Emotional Lability; Problems with Self-Concept) (Solanto et al., 2004).

The four scales correspond to the ADHD Index and the *DSM-IV* (1994) symptom lists for Inattention, Hyperactivity-Impulsivity, and Total ADHD (Solanto et al., 2004).

Cut-off T-score elevations were used to interpret the clinical scales on the CAARS. For example, T-score elevations of 65 and above are traditionally considered high or clinically significant. In terms of validity, the CAARS Inconsistency Index is used, and scores of 8 or above indicate that the protocol should be interpreted with caution, as it may be invalid.

Procedures

Permission to use shelf data was obtained from Dr. Steven Walfish. Once the Institutional Review Board review process was completed at the Philadelphia College of Osteopathic Medicine, and when permission was granted to proceed with the study, the existing data were obtained and entered into a spreadsheet. The archival data were entered into a spreadsheet by the responsible investigator, and quality-control steps were taken. Quality-control steps were as follows:

1. The researcher was provided initials and code numbers for each participant by Dr. Walfish.
2. Each record was reviewed for completeness.
3. Data were recorded on a spreadsheet in a de-identified format.
4. Each participant was assigned a code value.
5. Participant data were destroyed.

Collected data, including demographics and clinical information, were recorded in a Statistical Package for the Social Sciences (SPSS) file in the Psychology Department at the Philadelphia College of Osteopathic Medicine. Data analysis was conducted using the SPSS.

Risks to the Participants

There were no known risks to study participants and the archival data did not include identifying information.

Benefits to the Participants

There were no direct benefits to study participants.

Benefits to Others

The benefits of this study for others were twofold. First, as a result of this study, clinicians and researchers will be better equipped to assess and treat properly potential patients seeking GB through an increased understanding of this population. Second, clinicians and researchers will be better equipped to anticipate some of the difficulties patients may be facing when considering surgery and the associated barriers to long-term success post surgery.

Chapter Five: Results

A correlational research design was used to analyze data from a sample of 100 adults seeking presurgical psychological assessment to determine the relationship between variables on the MMPI-2 (psychological conditions) and CAARS (attentional problems). Psychological conditions were operationally defined as a T score of 65 or greater on any of the 10 MMPI-2 clinical scales. ADHD symptoms were defined as a T score of 65 or greater on any of the eight CAARS clinical scales.

Descriptive Statistics

Age

Participants ranged in age from 25 to 69 years. The mean age was 42.52 years with a standard deviation of 10.57.

Gender

The gender distribution for the total sample (N = 100) consisted of 84 women (84%) and 16 men (16%). This gender imbalance is consistent with previous studies of patients seeking weight-loss surgery (Zizza, Herring, Stevens, & Carey, 2003).

Marital Status

Marital status was distributed in the sample as slightly more than one quarter single (28%), slightly more than one half married (55%), and a minority divorced (15%).

Ethnicity

Ethnicity was distributed in the sample as 54 Caucasian (54%), 44 African American (44%), and 2 Hispanic (2%).

Prevalence of ADHD in patients seeking GB

Prevalence of Hyperactivity-Impulsivity Symptoms

SPSS version 18.0 was used to create a frequency distribution to examine the prevalence of symptoms of hyperactivity-impulsivity endorsed in this sample per the CAARS clinical scales. The majority of the sample did not endorse clinically significant levels of hyperactive-impulsive symptoms, but 5 % of the sample did. Specifically, 5% of the sample endorsed hyperactive-impulsive symptoms based on *DSM-IV-TR* (2000) criteria. Hyperactivity-impulsivity is considered to be relatively rare in adults with a diagnosis of ADHD, and previous estimates have reported that adults tend to exhibit problems with hyperactivity-impulsivity at a rate of approximately 3.3% (Gibbins et al., 2010). Also of note is the unexpected finding that 12% of the respondents endorsed elevated but subclinical levels of hyperactivity-impulsivity according to *DSM-IV-TR* (2000) criteria. Elevated but subclinical levels were defined as T scores ranging between 55 and 64.

Prevalence of Inattentive Symptoms

SPSS version 18.0 was used to create a frequency distribution to examine the prevalence of symptoms of inattentiveness endorsed in this sample per the CAARS clinical scales. The majority of the sample did not endorse clinically significant levels of inattentive symptoms based on the *DSM-IV-TR* (2000) while 3 % of the sample did.

Of the respondents, 11% endorsed subclinical levels of inattentive symptoms based on *DSM-IV-TR* (2000) criteria. Again, subclinical levels were defined as T scores ranging between 55 and 64.

Table 4 is a summary of the range of scores, means, and standard deviations obtained from the CAARS measure, which assessed for symptoms of and diagnostic criteria related to ADHD in this sample of patients seeking GB.

Table 4

Range, Mean, and Standard Deviation of Attention-Based Problems

CAARS Subscales	Minimum Range	Maximum Range	Mean	Standard Deviation
Inattention / Memory Problems	35	77	48.27	8.80
Hyperactivity / Restlessness	30	74	47.48	7.49
Impulsivity / Emotional Lability	30	81	44.13	7.83
Problems with Self-Concept	33	70	46.12	7.78
ADHD Index	29	83	46.57	10.81
DSM-IV Inattentive Symptoms	29	79	44.81	9.57
DSM-IV Hyperactive-Impulsive	26	82	45.42	10.39
DSM-IV Total ADHD Symptoms	32	71	44.23	7.68

Note. N = 100

Relationship Between the MMPI-2 and the CAARS Scores

SPSS version 18.0 was used to identify the relationship between clinically significant MMPI-2 clinical scales and specific CAARS clinical scales using a Pearson *r* correlation. Below is an explication of those relationships.

Hypochondriasis (Hs), the first MMPI-2 clinical scale, demonstrated a significant but weak positive relationship between scores on the Hs scale and DSM-Inattentiveness as measured by the CAARS ($r = .207$, $p < .05$, two-tailed). This relationship suggested that the greater the reported symptoms of Hs on the MMPI-2, the higher the reported symptoms of inattentiveness on the CAARS. A weak relationship was also revealed regarding DSM Symptoms Total Scale on the CAARS and the Hs scale ($r = .210$, $p < .05$, two-tailed). Problems with Self-Concept and the Hs revealed a weak relationship ($r = .268$, $p < .01$, two-tailed).

MMPI-2 Depression (D), the second clinical scale, correlated moderately with DSM-Inattentiveness ($r = .362$, $p < .01$, two-tailed). There was also a moderate correlation between the D scale and Problems with Self-Concept as measured by the CAARS ($r = .420$, $p < .01$, two-tailed). The CAARS Inattention subscale revealed a weak relationship ($r = .395$, $p < .01$, two-tailed). There was a weak relationship between D and DSM Symptoms Total Scale on the CAARS scale ($r = .279$, $p < .01$, two-tailed) as well as a weak relationship between D and the ADHD Index on the CAARS ($r = .259$, $p < .01$, two-tailed).

Hysteria (Hy), the third clinical scale as measured by the MMPI-2, showed a significant but weak positive relationship with DSM-Inattentiveness ($r = .243$, $p < .05$, two-tailed). There was also a weak relationship between Hy and DSM-Hyperactivity-Impulsivity ($r = .204$, $p < .05$, two-tailed). CAARS Inattention Subscale revealed a weak relationship with D ($r = .271$, $p < .01$, two-tailed). There was also a weak relationship with DSM Symptoms Total Scale and D ($r = .233$, $p < .05$, two-tailed).

Psychopathic deviance (Pd), which is the fourth clinical scale, failed to correlate with any of the CAARS subscales.

Masculinity-femininity (Mf) is the fifth clinical scale on the MMPI-2. There was a significant but weak inverse relationship between ratings of traditional gender roles and problems with self-concept as measured by the CAARS ($r = -.240$, $p < .05$, two-tailed).

MMPI-2 Paranoia (Pa) is the sixth clinical scale, and weak correlations were demonstrated with several of the following CAARS subscales: CAARS Inattention ($r = .289$, $p < .01$, two-tailed); Problems with Self-Concept ($r = .341$, $p < .01$, two-tailed); DSM-Inattentiveness ($r = .252$, $p < .05$, two-tailed); DSM-Hyperactivity-Impulsivity ($r = .234$, $p < .05$, two-tailed); DSM Symptoms Total ($r = .277$, $p < .01$, two-tailed); and ADHD Index ($r = .250$, $p < .05$, two-tailed).

Psychasthenia (Pt) is the seventh clinical scale on the MMPI-2 and correlated moderately with the following dimensions on the CAARS: CAARS Inattention ($r = .447$, $p < .01$, two-tailed) and Problems with Self-Concept ($r = .433$, $p < .01$, two-tailed).

Positive relationships were also revealed on the following dimensions, but to a somewhat lesser degree: DSM-Hyperactivity-Impulsivity (r = .398, p < .01, two-tailed), Impulse Control (r = .205, p < .05, two-tailed); DSM Symptoms Total (r = .317, p < .01, two-tailed); and ADHD Index (r = .323, p < .01, two-tailed).

MMPI-2 Schizophrenia (Sc), the eighth clinical scale, positively correlated with all of the CAARS scales. Moderately significant relationships were revealed with the following: CAARS Inattention (r = .407, p < .01, two-tailed) and DSM-Inattentiveness (r = .424, p < .01, two-tailed). Weak but positive relationships were evidenced by the following: DSM Symptoms Total (r = .379, p < .01, two-tailed); ADHD Index (r = .354, p < .01, two-tailed); DSM-Hyperactivity-Impulsivity (r = .285, p < .01, two-tailed); Problems with Self-Concept (r = .267, p < .01, two-tailed); CAARS Hyperactive-Restlessness (r = .246, p < .05, two-tailed); and CAARS Impulse Control (r = .234, p < .05, two-tailed).

The MMPI-2 Hypomania (Ma), the ninth clinical scale, correlated weakly with the following items on the CAARS: DSM-Hyperactivity-Impulsivity (r = .288, p < .01, two-tailed); ADHD Index (r = .285, p < .01, two-tailed); CAARS Hyperactive-Restlessness (r = .269, p < .01, two-tailed); CAARS Impulse Control (r = .260, p < .01, two-tailed); and DSM Symptoms Total (r = .249, p < .05, two-tailed). The results of this study indicated that those who endorsed items on the MMPI-2 Ma scale also tended to endorse items related to hyperactivity and impulsivity on the CAARS.

The final MMPI-2 clinical scale, Social Introversion (Si), correlated to a moderate degree with Problems with Self-Concept ($r = .425$, $p < .01$, two-tailed). To a weak but still significant degree, Si correlated with the following CAARS subscales: CAARS Inattention ($r = .295$, $p < .01$, two-tailed); DSM-Inattentiveness ($r = .290$, $p < .01$, two-tailed); ADHD Index ($r = .222$, $p < .05$, two-tailed); and DSM Symptoms Total ($r = .214$, $p < .05$, two-tailed). These relationships suggested that the greater the tendency to withdraw from social situations, the higher the reported problems with self-concept and inattentiveness.

Table 5 reflects correlations obtained from the 100 participants in this study between the MMPI-2 and CAARS. Each MMPI-2 clinical scale was correlated to each scale on the CAARS in order to determine whether relationships existed between axis I conditions and attention-based problems.

Table 5

Frequency Distribution of MMPI-2 and CAARS Subscales

MMPI-2 Scale	CAARS Inattention	CAARS Hyperactive-Restlessness	CAARS Impulse Control	CAARS Self Concept	*DSM-IV* Inattention	*DSM-IV* Hyperactive	DSM Symptoms Total	ADHD Index
Scale 1	.191	.142	.179	.268**	.207*	.193	.210*	.139
Scale 2	.395**	-.011	.172	.420**	.362**	.120	.279**	.259**
Scale 3	.271**	.126	.116	.192	.243*	.204*	.233*	.090
Scale 4	.120	-.056	.002	.026	.059	.029	.057	.101
Scale 5	-.130	-.011	-.114	-.240*	-.143	-.002	-.097	-.147
Scale 6	.289**	.081	.166	.341**	.252*	.234*	.277**	.250*
Scale 7	.447**	.103	.205*	.433**	.398**	.179	.317**	.323**
Scale 8	.407**	.246*	.234*	.267**	.424**	.285**	.379**	.354**
Scale 9	.132	.269**	.260**	-.041	.179	.288**	.249*	.285**
Scale 10	.295**	.028	.182	.425**	.290**	.094	.214*	.222*

Note. MMPI-2 Scales refer to the corresponding clinical scales. Each CAARS domain refers to the eight subscales. This table reflects correlations between the clinical scales of the MMPI-2 and each CAARS subscale.
* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Chapter Six: Discussion

The purpose of this study was twofold. First, we sought to determine whether the prevalence of ADHD was higher in patients seeking GB than in the general population. Second, we examined the relationship between certain executive-functioning deficits and specific clinical conditions in patients seeking GB. The hypothesis was that there would be a positive relationship among obesity, ADHD, and associated psychological conditions. The study yielded some weak-to-moderate positive correlations in these regards. The findings also revealed overlap among constructs related to depression, problems with concentration, and anxiety, as well as among problems related to hyperactivity/impulsivity, inattentiveness, and overall executive-functioning deficits. Furthermore, weak-to-moderate relationships existed among inattentiveness, hyperactivity-impulsivity, and problems with self-concept, as measured by the CAARS, and among paranoia, schizophrenia, psychasthenia, and social introversion. Attentional problems, characterized by inattentiveness and hyperactivity-impulsivity, were speculated to relate to the same executive-functioning processes as those measured by the paranoia and schizophrenia scales. Logically, individuals experiencing the aforementioned deficits would also endorse psychological discomfort, as measured by psychasthenia, as well as exhibit social withdrawal and even isolation, as measured by the social introversion scale. Considering individuals presenting for GB surgery exhibit problems related to self-concept, as measured by the CAARS, social problems would understandably be endorsed.

Whether tendencies to withdraw reflect ineffective coping skills or occur secondarily to problems with managing anger that lead to alienation are present, such relative isolation would likely maintain or even exacerbate an individual's ability to manage emotions effectively given lack of feedback and, thus, support by others.

Research Findings

The prevalence of total ADHD symptoms in this GB sample was 4%. These results are consistent with the prevalence of ADHD in the general population of 3.5% to 5% (Adler et al., 2008; Davidson, 2008; & Kessler et al., 2006). The prevalence of the inattentive subtype in this study, based on *DSM-IV-TR* (2000) criteria, was 3%. Surprisingly, although an overall 4% prevalence rate of ADHD is consistent with rates in the general population, individuals in this sample exhibited increased levels of hyperactivity (5%) compared to preliminary findings in the literature reflecting a 3.3% prevalence of hyperactivity in adults (Gibbins et al., 2010). Interestingly, the hyperactive-impulsive subtype predominated the inattentive variety at 5% to 3%, respectively. This finding is the opposite of what one would expect in an adult population (Kessler et al., 2010).

Also of interest is the finding that 12% of the sample endorsed relatively high but subclinical levels of hyperactive-impulsive symptoms while 11% of the sample endorsed relatively high but subclinical levels of symptoms of inattentiveness.

Given that symptom profiles of individuals with ADHD change over time, in addition to the aforementioned limitations of the current diagnostic criteria, these subclinical findings likely represent an underestimation of the prevalence of attention-based problems in this sample. Subclinical levels of ADHD symptoms were operationally defined as T scores between 55 and 64, which is elevated but still within one standard deviation of the mean (Table 6). While the statistics regarding the subclinical findings may represent the symptoms of this population accurately, the CAARS quite possibly did not capture symptoms related to hyperactivity-impulsivity and inattentiveness that would be reflective of functional impairment arising from ADHD. It is not hard to imagine that inattentiveness and impulsivity could be related to the "mindless eating" and impulsive overeating and obesity seen in this sample. Consequently, a clinical interview may be more sensitive to identifying ADHD-related symptoms in this population, based on the preliminary research by Altfas (2002), who reported prevalence rates of ADHD in a GB population of as high as 42.6%. Furthermore, none of Altfas' participants in the study met criteria for hyperactivity-impulsivity and were all classified as having the inattentive type.

Further support for the presence of ADHD symptoms comes from research regarding the efficacy of atomoxetine, which showed a decrease in BED after a brief trial (Gadde, Yonnish, Wagner, Foust, & Allison, 2006; McElroy et al., 2007). Therefore, patients seeking GB could potentially benefit from future research that examines the effect of atomoxetine in problematic eating behavior.

Additionally, the preliminary research pertaining to atomoxetine illuminates the need for research into the neuropsychological underpinnings of adults presenting for GB surgery.

Kessler et al. (2010) examined symptoms most predictive of ADHD in adults by using the Adult ADHD Clinical Diagnostic Scale (ACDS), which is a semi-structured clinical interview that incorporates full assessment of ADHD in addition to supplementary questions designed to assess nonADHD symptoms that have been observed throughout the clinical work of the scale developers. Non-DSM-IV-TR symptoms pertained to executive-functioning factors, such as difficulties with planning, prioritizing, multitasking, remembering details, meeting deadlines, and maintaining self-discipline (Kessler et al., 2010). The researchers indicated the need for future research regarding subthreshold, or subclinical, manifestations of ADHD and indicated that symptoms associated with executive-functioning deficits appear to be key symptoms that emerge as more important in adulthood than in childhood. Therefore, the results of this present study indicated that subclinical symptoms of ADHD are consistent with emerging literature indicating that a broader set of criteria is applicable in adults.

Similar to Altfas' (2002) sample, which included participants who were able to afford out-of-pocket insurance costs, the participants in this present study included individuals who could afford to pay for their own insurance and residual billing. The implication is that our sample included individuals from a relatively high socioeconomic background. This sample was comprised of 84% women, which was relatively consistent with the gender composition of Altfas' (2002) study, which included 90% women.

Considering that follow-up studies regarding adults with the hyperactive subtype of ADHD demonstrate lower socioeconomic status (Barkley & Fischer, 2011), future research should include individuals from various socioeconomic backgrounds.

Table 6

Frequency Distribution of CAARS Subscales

CAARS Subscales	25-34	35-44	45-54	55-64	65-74	75-84
Inattention / Memory Problems	0	41	44	8	5	2
Hyperactivity / Restlessness	2	35	51	8	4	0
Impulsivity / Emotional Lability	7	50	33	8	1	1
Problems with Self-Concept	2	47	36	12	3	0
ADHD Index	12	35	37	8	6	2
DSM-IV Inattentive Symptoms	13	40	33	11	2	1
DSM-IV Hyperactive-Impulsive	11	38	34	12	3	2
DSM-IV Total ADHD Symptoms	6	54	33	3	4	0

Note. The number in each cell represents the number of participants corresponding to the CAARS subscales and the rate of prevalence. $N = 100$. Subclinical scores were operationally defined as scores ranging between 55 and 64. Scores of 65 and above are considered clinically significant.

Taken together, because of the documented tendency of patients with ADHD to underreport symptoms, likely because of lack of awareness, it is possible that assessment for ADHD symptoms in a GB population is more robust when a semi-structured interview or collateral informants are used, such as in the Altfas (2002) study, in combination with objective measures, rather than solely relying on a self-report measure, such as the CAARS. In fact, even the CAARS' publisher recommends gathering collateral, confirmatory data and they provide measures to do so; for example, the CAARS-Other scales (Rosler et al., 2006).

An additional issue is whether or not the current diagnostic criteria for ADHD, which is based on children, accurately reflect presentation of the disorder in adults. Just as likely is the possibility that other patients seeking GB may simply experience symptoms that fail to meet DSM diagnostic criteria. In any event, there is an increased likelihood that problems with executive functioning could be missed altogether in patients presenting for GB surgery that gone unrecognized and untreated, may pose a threat to postsurgical outcome.

In terms of the findings related to MMPI-2 scales, several interesting findings emerged. For instance, the relationship between the first clinical scale of the MMPI-2, Hs, demonstrated a weak and positive relationship to symptoms of inattentiveness. This indicates a mild correlation between a scale designed to identify individuals with health-related preoccupations and with pessimistic tendencies and symptoms of inattentiveness.

Specifically, individuals who internalize psychological discomfort via somatic complaints tend to exhibit a pattern of avoidance stemming from inattentiveness. This avoidance may be attributable, in part, to demoralization related to difficulties with effectively managing factors requiring problem solving and a tendency to become overwhelmed easily. Moreover, as one focuses attention increasingly on somatic issues, cognitive resources may become overwhelmed and impairing functional attention.

The implications of the moderate correlation between D, the second clinical scale, and inattention problems is twofold: first, individuals who endorsed symptoms of depression also endorsed inattention; second, problems with concentration are typically reported by individuals who experience either depression or attentional problems, therefore indicating that this finding may reflect the same underlying construct of reduced sustained attention rather than a distinct set of psychological sequelae. After all, decreased concentration is a symptom of both ADHD and Major Depressive Disorder (APA, 2000).

Elevations on the Hy scale, the third clinical scale, are suggestive of individuals who often feel overwhelmed and react to stress and avoid responsibility by developing physical symptoms (Graham, 2000). Furthermore, they report lack of energy and sleep disturbances and typically exhibit lack of insight regarding their own motives and feelings.

The weak relationship between Hy, as measured by the MMPI-2, and symptoms of inattentiveness suggested that individuals who present with a lack of mindfulness tend to exhibit emotional reactivity rather than cope with their problems and regulate their emotions. Given that problems related to inattentiveness logically lead to general disorganization, it is not surprising that individuals who endorsed inattentiveness also endorsed problems related to feelings of being overwhelmed and anticipatory anxiety, as is the experience with anxiety. In some cases, such anxiety may be related to compensatory strategies that help adults with ADHD to prepare for future tasks. Also, the relationship between Hy and hyperactivity-impulsivity revealed weak yet positive findings, indicating that the same deficits responsible for emotional reactivity and emotional dysregulation may be related to deficits responsible for delaying gratification and/or self-soothing. Of course, many overeaters often report problems related to gratification and inability to engage in successful self-soothing.

The results of the finding regarding the weak inverse relationship between Mf, the fourth clinical scale as measured by the MMPI-2, and self-concept suggest that individuals who reject traditional gender roles experience problems with self-concept. Considering a population of individuals seeking GB is one that is generally so desirous of a more slender physique that they are willing to undergo major surgery to achieve it, individuals who perceive that their physical appearance does not reflect traditional and stereotypical gender ideals would reasonably experience problems related to self-concept as measured by the Mf Scale.

Correlations existed between symptoms characterizing Pa, the sixth clinical scale of the MMPI-2, and executive-functioning problems. Pa was related to deficits in self-concept, inattentiveness, and hyperactivity-impulsivity. Specifically, a moderate positive relationship was discovered between *DSM-IV-TR* (2000) inattentiveness and symptoms related to feeling picked on, anger and resentment, and a tendency to use projection as a defense mechanism. Additionally, individuals in this sample endorsed weak and positive relationships between hyperactivity-impulsivity and items on the Pa scale, such as previously described. Individuals with tendencies to project their problems onto others not surprisingly endorsed weak self-concept, considering that the defense mechanism known as projection includes externalization of one's problems and exhibiting difficulty with taking responsibility for the same (Graham, 2000). Problems related to managing anger, such as those observed in individuals with eating disorders, tend to be characterized by impulsive actions. Therefore, difficulties in the expression of anger are also not surprising, considering that such problems tend to be core features of problems with eating (Fassino, Leonbruni, Piero, Abbate-Daga, & Rovera, 2003). Furthermore, inhibitory functioning deteriorates in the presence of emotional stimuli in individuals with problems related to emotional reactivity, thus suggesting that difficulties with effectively managing one's emotions would lead to problems with self-concept and ability to accurately perceive the origin of one's distress (Lampe et al., 2007).

There were several correlations between Pt, or MMPI-2 anxiety, and problems related to executive functioning. Specifically, moderate correlations existed between anxiety and the following CAARS subscales: Inattention, DSM hyperactivity–impulsivity, Problems with Self-Concept, overall *DSM-IV* (1994) symptoms of inattention, DSM ADHD Symptoms Total, and ADHD Index. These findings indicated that the greater the number of ADHD symptoms reported by the participants, the greater the overall psychological discomfort experienced by them. This finding could be explained by the high comorbidity frequently found between anxiety disorders and ADHD. Also, adults with ADHD often have a history of repeated failures. Anticipatory anxiety seen in Pt may function as a compensatory coping strategy to prepare for expected difficulties. If individuals have exhibited difficulty adhering to previous weight-loss regimens, for example, then individuals would likely experience symptoms of anxiety when faced with situations in which they perceive they previously have failed. One should note that, however, moderate levels of anxiety can be a motivator for change and actually improve treatment outcome (Ramsay & Rostain, 2008).

The MMPI-2 Sc scale correlated moderately with Inattention and Problems with Self-Concept and, to a lesser degree, with all of the other CAARS variables. For example, problems related to decision making and problem solving correlated weakly with Hyperactivity-Impulsivity, an index of ADHD symptoms, and *DSM-IV-TR* (2000) based problems with Inattentiveness and Hyperactivity-Impulsivity.

These findings indicated that the greater the problems related to disturbances of thinking, impulse control, social alienation, sex, and aggressive, withdrawn, or bizarre behavior, the greater the reported problems with inattentiveness, hyperactivity-impulsivity, and self-concept. The Pa scale revealed similar findings, this offering greater evidence that symptoms related to psychotic processes, such as paranoia, and symptoms related to attention, taken together, actually reflect problems with executive functioning that are measured on both instruments. Essentially, individuals who scored high on the Pa and Sc MMPI-2 clinical scales also reported consistent attentional problems across most, if not all, of the items on the CAARS. Hypervigilance demonstrated by individuals with a tendency toward paranoid ideation limits adaptive attention and increases activity to the point that the activity registers as hyperactive and impulsive, as measured by the CAARS. Deficits with thinking processes, social alienation, and bizarre perceptual experiences produce similar symptoms, indicating that the frontal lobe dysfunction in both disorders produces similar symptoms, as measured by the MMPI-2 and CAARS.

The relationship between MMPI-2 Ma and the areas of Hyperactivity-Impulsivity, *DSM-IV* (1994) symptoms of hyperactivity, DSM ADHD Symptoms Total, and ADHD Index revealed weak correlations and suggested that there could be symptom overlap regarding the underlying symptoms related to hypomania and attentional processes. Both hypomania and hyperactivity-impulsivity are characterized by similar symptoms, such as excessive talking, distractibility, and psychomotor agitation.

Specifically, the symptoms of hypomania and hyperactivity-impulsivity are so similar that they often lead to diagnostic uncertainty, which is frequently resolved by identifying the episodic nature of BPD versus the more chronic course of ADHD (Barkley et al., 2008).

Symptoms consistent with Si correlated moderately with Problems with Self-Concept and, to a weak degree, problems with Inattention and overall ADHD symptoms. Essentially, problems related to self-confidence, interpersonal sensitivity, tendencies to give up easily, and motivation to achieve were related to symptoms of Inattentiveness. Again, this is not surprising given the inherent problems related to persistence in individuals with symptoms of inattentiveness and a history of repeated failure. This finding is consistent with research by Coleman et al. (1998) who found that two distinct groups, one with ADHD and the other with Sc, both endorsed high scores on the Si scale. This, again, indicates that similar processes are responsible for levels of weak-to-moderate endorsement related to thinking, perceptions, and decision making, resulting in distress manifested by withdrawal and isolation. This is not surprising given the moderate levels of psychological discomfort, or MMPI-2 anxiety, endorsed by individuals experiencing problems with executive functioning.

In summary, this study revealed that some patients seeking GB exhibit executive-functioning deficits as evidenced by symptom endorsement on both the MMPI-2 and CAARS. This supports the premise that executive-functioning deficits pose serious implications for a subgroup of individuals who are considering GB surgery.

Life postoperation requires the individual to sustain major life changes, such as regular exercise and maintaining dietary changes. In adult patients seeking GB, symptoms of ADHD and other psychological disorders leading to impairment in executive functioning, including planning, managing impulses, and organizing one's life, can become serious obstacles to recovering from the surgery and maintaining lifestyle changes; therefore, the implications necessitate sound psychological interventions to address the aforementioned factors, thereby increasing optimal postsurgical outcome.

The majority of patients seeking GB did not have even subclinical ADHD symptoms. However, 11% and 12% endorsed subclinical levels of Hyperactivity-Impulsivity and Inattentiveness, respectively. Considering the developmental trajectory of ADHD from hyperactivity-impulsivity in childhood to inattentiveness in adulthood, those whose symptoms would otherwise warrant clinical consideration of an ADHD diagnosis simply display a different set of symptoms that are not captured by the current diagnostic criteria. It is speculated that the majority of gastric bypass patients did not endorse even subclinical levels of ADHD symptoms because of a variety of factors yet to be uncovered. Preliminary evidence suggests that certain features, such as difficulties with effectively managing anger and behavioral disinhibition, could reflect characteristics consistent with a diagnosis pertaining to Borderline Personality Disorder, which could account for the obesity levels in this sample. Sansone, Wiederman, and Monteith (2001) examined relationships among body, borderline personality symptomatology, and body image in a sample of women presenting for a psychiatric evaluation.

While the women in their sample were not specifically seeking treatment for obesity, levels of body-image dissatisfaction correlated to borderline personality symptoms regardless of BMI. The researchers posited that the aforementioned relationship existed as a result of problems with self-regulation known to be present in individuals with Borderline Personality Disorder. Behavioral problems, such as overeating, that manifest and/or are maintained as a result of distorted thinking require effective clinical intervention if individuals presenting for GB surgery are to be successful.

Relevance to Cognitive Behavioral Therapy (CBT)

CBT helps individuals to recognize their existing maladaptive cognitive patterns and assists them with developing skills to compensate for deficits and to replace distortions with more accurate thoughts. Individuals who experience executive-functioning deficits clearly are at increased risk for problems related to effective problem solving, with self-concept, impulse control, and management of psychological distress – exactly the types of problems that can further jeopardize successful outcome for patients seeking GB. Problems related to hyperactivity-impulsivity pose significant risk to individuals seeking GB surgery because of concerns about the potential for noncompliance with medical recommendations, and thus, safety. Hyperactivity-impulsivity also could lead an individual to resume disordered eating if it is not adequately addressed as a result of insufficient coping abilities.

Consequently, CBT for ADHD is an appropriate therapeutic modality for individuals with the aforementioned problems because of its emphasis on skill building, compensating for cognitive deficits, and cognitive restructuring.

With the discovery of the problems related to inattentiveness and overall general distress in a significant portion of this population, clinicians may consider implementing mindfulness-based strategies in combination with CBT with patients seeking GB in order to alleviate psychological discomfort by increasing skills to manage it. Of course, pharmacotherapy is indicated when attention deficits are severe. Basically, many individuals presenting for GB surgery require clear assistance with mood management, impulse control, cognitive restructuring, and skillbuilding as they shift away from using food as self-medication. Treatment should then focus on implementing more effective coping strategies in order to increase the likelihood for success. The picture that emerges in this sample of patients seeking GB reflects a probable underestimation of the prevalence of deficits in executive functioning and impulsivity. This should not be surprising given the problems known to be present in individuals who lack impulse control and use maladaptive coping strategies, such as, in many of the current cases, overeating.

Suggestions for Future Research

Considering that comorbidity between ADHD and axis I conditions is the rule rather than the exception, future research should include an examination of the relationship between ADHD and axis I conditions in order to uncover whether disorder-specific cognitive distortions exist. By uncovering the links between attentional problems and distorted cognitions, clinicians will be able to better identify the maladaptive thinking patterns of their clients and thus be in a position to assist them in developing strategies to challenge distorted cognitions and thereby lead to improved accuracy of perception. In addition, if ADHD-specific cognitive distortions exist, individualized treatment protocols can be developed to assist those struggling with attention-based problems. Furthermore, given the self-concept problems known to be present in patients seeking GB, future research must examine the role of cognitive distortions, especially with consideration to the maladaptive attempts to self-soothe, in this case by overeating, that have the potential for gravely negative health consequences.

This present study also highlights the necessity for future research to examine the role of axis II conditions in patients seeking GB, which could explain the difficulties some patients experience in maintaining lifestyle changes. Given the emotionality reactivity, problems with compliance, and problems with authority that characterize certain axis II conditions, it is worthwhile to explore this domain.

Interestingly, while CD and ADHD are known to be highly correlated, thus leading to Antisocial Personality Disorder in adulthood, there were no significant findings on a scale to measure such features, as evidenced by the Psychopathic Deviate Scale on the MMPI-2. This author's belief is that future research should include a comprehensive investigation of the relationship between Antisocial Personality Disorder and ADHD in patients seeking GB, especially since we found a higher than expected level of hyperactivity (5%) in this sample. Essentially, individuals with ADHD hyperactive-impulsive type tend to fare worse than their inattentive subtype counterparts, including increased rates of antisocial behaviors, which only emphasizes the question as to why there would be a lack of significance on the Psychopathic Deviance Scale. General biases in the literature tend to favor Borderline Personality Disorder for women versus Antisocial Personality Disorder, which is more often diagnosed in men. Regardless, this area requires further scientific exploration.

Overall, the link between attention deficits and obesity in preoperative patients seeking GB appears to relate to both hyperactivity-impulsivity and inattentiveness, with a surprisingly higher percentage of hyperactivity-impulsivity discovered in this particular sample (5%). Future research should include implementing a broader set of criteria for accurately diagnosing adults with attentional problems, considering the limitations of the current *DSM-IV-TR* (2000) diagnostic criteria. This study did not examine certain demographic variables that could illuminate aspects of the population.

For example, educational attainment and socioeconomic status may inversely correlate with axis I conditions, somatic complaints, and attentional problems, because a downward social drift tends to result from such disorders that present major obstacles to goal attainment. Similarly, there is anecdotal evidence that a higher percentage of patients seeking GB from lower socioeconomic levels present with more symptoms of ADHD (R. Petrucci, personal communication, January 10, 2011). Given that the concept of executive functioning is largely theoretical in nature and considering that there is not at present a widely agreed upon operational definition, future research should include specific markers for examining executive functioning. For example, Barkley and Fischer (2011) suggested that adult occupational functioning would be most heavily impacted by executive-functioning deficits observed in adults with ADHD considering the need for cross-temporal organization and maintenance of behavior and problem solving toward goals across days, weeks, and months. Conducting a thorough examination of an individual's occupational history, in addition to current clinical assessments, possibly could illuminate important clinical information regarding how well an individual would be expected to navigate the changes associated with GB surgery.

The current study involved predominantly Caucasian and married women. It would be important to examine the links between executive-functioning deficits and obesity in other demographic groups, considering the known diversity in both ADHD diagnostic categories and individuals with obesity. This study also did not examine the relationship of BMI to clinical scales on the MMPI-2 and the CAARS.

Future research can examine the hypothesis that as BMI increases, so do the frequency and severity of axis I conditions, including ADHD. Furthermore, future research could examine the role of trauma in obesity in patients seeking GB. It would be interesting to consider the chronicity of traumatic responses in obese individuals and corresponding BMI levels in order to identify a clinical point of intervention for both the traumatic response and the obesity.

Limitations of the Current Study

There are several limitations to the current study. These include a limited sample size (N = 100). A larger scale study might help to allow for greater generalization of the findings to the broader population of individuals seeking GB surgery. Additionally, certain variables were not examined in detail, such as the CAARS Inconsistency Scale, which could provide further insight into levels of defensiveness in this population as it relates to attentional problems when compared to MMPI-2 validity scales. One should note that all participants in the current study had valid MMPI-2 scales, which have far greater documented validity than does the CAARS. Psychotropic medication status was not assessed; therefore, it is impossible to state whether medications typically prescribed for attentional problems, such as stimulants, mediated both obesity and attentional problems in this sample and in the broader population of patients seeking GB. Furthermore, some elevations on the MMPI-2 Sc scale are found in individuals who are reporting unusual experiences, feelings, and perceptions related to the use of prescription and nonprescription drugs, especially amphetamines (Graham, 2000).

Given that amphetamines are typically prescribed to individuals with ADHD, the potential impact psychostimulant medications may have had in this sample is further raised, considering that medication status was not assessed.

Moreover, the entire study sample was limited to participants who resided in the Atlanta, Georgia area. This could present further limitations regarding generalization of findings to individuals who reside in other areas of the country. Additionally, because the study was correlational in design, no causal inferences can be made.

Conclusions

Although the author's theoretical belief is that executive-functioning deficits lead to the overweight and obesity status in preoperative patients for GB, just as likely is that executive-functioning deficits occur subsequent to having an overweight or obese status in the first place. The degree to which an individual experiences weight problems might be related to the degree of problems related to executive functioning insofar as impulse control, planning, sustaining attention to a task, and the ability to engage in emotional regulation are compromised.

Using the CAARS as a guide, we found levels of ADHD in this sample of presurgical patients seeking GB consistent with those of the general population. However, we also discovered a rate of hyperactive-impulsive symptoms that appears to be greater than that in the normal population. Hyperactivity-impulsivity in adults with ADHD is considered to be rare (3.3%), and some researchers have questioned whether the hyperactivity-impulsivity subtype truly exists.

Impulsive behavior might relate to observable deficits in the performance of the self-regulatory functions of daily life (Kessler et al., 2010). The hyperactivity-impulsivity observed within this sample actually might reflect a broader dimension of ADHD known as emotional impulsiveness (Barkley & Fischer, 2011; R. Ramsay, personal communication, April 7, 2011). Emotional impulsiveness contributes to impairment in adults with attentional problems and generally relates to difficulty tolerating and regulating emotions in a way that is consistent with long-term goals. Understandably, patients seeking GB would be inclined to struggle with managing problems related to emotional impulsivity, thus leading to an overweight or obesity-weight status. Findings related to subclinical levels of ADHD indicated that there is a potential for undiagnosed psychological problems, attentional and impulsive in nature, present in this population and resulting in subtle difficulties. The results of this study highlight the need for more finely tuned psychological assessment and intervention.

Research regarding obesity continues to be disproportionately under-researched across health-related disciplines in comparison to the societal epidemic of obesity. Compounding the problem is the paucity of research regarding the role of executive functioning in this population. A comprehensive CBT modality for overweight and obese individuals seeking GB surgery currently does not exist.

The biopsychosocial underpinnings of CBT and the effectiveness of the model in ameliorating psychological distress, difficulty with problem solving, impulsive behavior, and attentional problems makes CBT a good candidate for research as a first-line treatment for patients seeking GB. This study highlights the importance of proper assessment and treatment for individuals presenting for GB surgery to assist them in behavioral change and persistence in their quest for dramatic lifestyle change.

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